# Supplementary Online Content

Liu Z, Gao P, Gao AY, et al. Effectiveness of a multifaceted intervention for prevention of obesity in primary school children in China: a cluster randomized clinical trial. *JAMA Pediatr*. Published online November 8, 2021. doi:10.1001/jamapediatrics.2021.4375



This supplementary material has been provided by the authors to give readers additional information about their work.

**eMethods. Additional Description**

**Process evaluation**

We used various methods to collect the process data to assess the intervention implementation: (1) the trained project staff went to each intervention school for at least two times per week and recorded the quality, quantity and attendance rate of the intervention sessions; for example, the trained project staff let five students in the intervention school to wear the EPSON Multisport Watch (ProSense J-50) to monitor heart rate during physical activity sessions, and these monitoring data were used to assess whether physical activity achieved moderate to vigorous intensity; (2) children were taught to record their physical activity sessions on every school day; (3) parents were required to report their involvement in reinforcing children's physical activity outside of school via the self-administered questionnaires after the intervention ended; and (4) the computer software system recorded parental frequency and duration of using the smartphone app.

**Analyses of associations between parental frequency of using the smartphone app and change in BMI among the children in the intervention group**

Exposures included frequency of tracking BMI of the children via the smartphone app, frequency of completing "small hand in big hand" homework via the smartphone app, frequency of recording diet and physical behaviors of the children via the smartphone app, and the total frequency of parental engagement in all of these three activities. Exposure variables were categorized into quartiles. Outcomes included adjusted mean change in BMI and Z-score of the children in the intervention group from baseline to 9 months. Linear mixed models were used to account for the clustering effect of school and adjusted for the baseline outcome values, age and sex of the children. No adjustment was made for multiplicity of inferences for these post hoc analyses, and results were reported as point estimates and 95% CI (without *P*-values).

**eTable 1. Description of the Multifaceted Intervention Components**

| Intervention components | Who delivered | When delivered | What delivered |
|---|---|---|---|
| **Three components targeting children** | | | |
| 1. Health education | Trained class teachers | Every 2 to 3 weeks (10 sessions[§]) | Five core messages: two "*NOT*", two "*LESS*", and one "*MORE*" messages[*] were lectured on class |
| 2. Reinforcement of physical activity | Trained physical education teachers | Every school day | One-hour moderate-to-vigorous-intensity physical activity per day within school |
| 3. BMI monitoring and feedback | Trained health care teachers | Monthly | Monitoring body weight and height of the children, and providing feedback on BMI status and changes |
| | Children | Weekly | Measuring body weight only |
| **Engaging schools to support children's behavioral changes** | | | |
| 1. School policies supporting obesity prevention | Trained school teachers[&] | Every school day | Not selling, eating, or buying unhealthy snacks or sugar-sweetened beverages within school[Ψ] |
| 2. Health education for school teachers[&] | Trained project staff | In the first month (1 session) | Five core messages |
| **Engaging families to support children's behavioral changes** | | | |
| 1. Health education for parents | Trained project staff | In the start and halfway of the 1st semester, in the start of the 2nd semester (3 sessions) | Five core messages; feedback on children's BMI and behaviors through app |
| 2. Reinforcement of children's physical activity outside school | Parents | Every day | Supervising and encouraging children to perform physical activities outside of school |
| 3. Supporting children to manage body weight | Parents | Weekly | Recording and tracking diet and physical activity behaviors of the children (weekly) through app |
| | | Monthly | Tracking BMI of the children (monthly) through app |

[§] eTable 2 describes the outline of the 10 activities. [*] NOT eating excessively; NOT drinking sugar-sweetened beverages; LESS high-energy food; LESS sedentary time; MORE physical activities. [&] School teachers included school principals, class teachers, health care teachers, and physical education teachers. [Ψ] "Not selling": Not selling unhealthy snacks or sugar-sweetened beverages within school; "Not eating": Telling students not to eat unhealthy snacks or drink sugar-sweetened beverages within school; "Not buying": Students being educated by class teachers not to buy unhealthy snacks or sugar-sweetened beverages around school. In the health education sessions delivered to school teachers (described in the following row in eTable 1), school teachers were also suggested not to buy or eat unhealthy snacks as adult modeling of these behaviors. Abbreviation: BMI=body mass index.

**eTable 2. Outline of the Health Education Activities for Children**

| No. | Activities* | Content | |
|---|---|---|---|
| | | **Messages (for lecture) or themes (for class meeting)** | **"Small hand in big hand" homework** |
| **The first semester** | | | |
| 1 | Lecture 1 | Benefits of a healthy weight; measurements and determination of weight status; how to achieve a healthy weight | Finding own body weight; using "nutrition evaluation turnplate"; recording behaviors via the smartphone application |
| 2 | Lecture 2 | More physical activities; less sedentary behavior | Challenge of "say no" to screen for three days |
| 3 | Theme class meeting 1 | Overcoming difficulties in behavioral change through sharing of experiences | Keeping a diary of snacks and drinks |
| 4 | Lecture 3 | No excessive eating; no sugar-sweetened beverages | Challenge of no sugar-sweetened beverages and not eating in restaurants for three days |
| 5 | Lecture 4 | Less high-energy food | Collecting the wrapping paper of drinks and snacks; design of campus poster |
| 6 | Theme class meeting 2 | Overcoming difficulties in behavioral change through sharing of experiences | Health tabloid--"my story" |
| **The second semester** (The focuses were on: (1) consolidation of information learned in the first semester; (2) sharing of experiences; (3) persistence in behavior changes) | | | |
| **7** | Lecture 5 | Balance in diet and physical activity; persistence in behavior change | Awareness of weight change; persistence in behavior change |
| **8** | Lecture 6 | More physical activities; less sedentary behavior | Performing physical activities with family members |
| **9** | Lecture 7 | How to select healthy food | Preparation for art show "diet, physical activity and healthy weight" |
| **10** | Theme class meeting 3 | Summary of health education messages delivered in art show activities | |

*Notes: the health education lecture was focused on disseminating core messages, while the theme class meeting was focused on transferring knowledge into action by interactive and interesting team work.

**eTable 3. Measurements and Their Associated Outcome Variables**

| Measurements | Time points | | | Instrument | Number of measures at each time point | Method of assessment | Outcome variables |
|---|---|---|---|---|---|---|---|
| | Baseline | 4 months | 9 months | | | | |
| **Adiposity** | | | | | | | |
| Height | Yes | Yes | Yes | Stadiometer (Huateng GMCS-1) | Twice (third measure if difference > 0.5 cm)[1] | Measured to the nearest 0.1 cm | BMI, BMI Z-score (together with children's sex and date of birth) [1], prevalence of overweight or obesity, prevalence of obesity, incidence of overweight or obesity, incidence of obesity, remission of overweight or obesity, remission of obesity (BMI status was defined according to both Chinese national screening criteria [2] and WHO criteria [1]) |
| Weight | Yes | Yes | Yes | Lever scale (Wujin RGT-140) | Twice (third measure if difference > 0.1 kg)[2] | Measured to the nearest 0.1 kg | |
| Body fat percentage | Yes | No | Yes | Body component instrument (Tanita MC-780 MA) | Once | According to instructions of the instrument | Body fat percentage |
| Waist circumference | Yes | Yes | Yes | Tape (MyoTape) | Twice (third measure if difference > 1.0 cm)[3] | Measured to the nearest 0.1 cm | Waist circumference, waist-to-hip ratio |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Hip circumference | Yes | Yes | Yes | Tape (MyoTape) | Twice (third measure if difference > 1.0 cm) [3] | Measured to the nearest 0.1 cm | |
| **Physical activity and dietary behaviors*** | | | | | | | |
| Stage of behavior change for weight management | Yes | No | Yes | The validated items measuring stages (in the action stage versus in the pre-action stage) of behavior change for the purpose of weight management [9] | Once | | Percentage of children in the action stage of behavior change for weight management (children actually being initiated come behavioral change, in comparison with those in the pre-contemplation (i.e., not thinking about becoming engaged in the behavior change) or contemplation (i.e., not involved in the behavior change but was considering getting involved in the behavior in the near future) stage) |
| Dietary behavior | Yes | No | Yes | An updated version of a previously validated Block Kids Food Screener questionnaire [7]; previously validated Children Eating Behavior Questionnaire [8] | Once | Children finished the questionnaires in the classroom in the presence of the trained outcome assessors who can provide guidance and help. | Percentage of children who did not drink sugar-sweetened beverages, percentage of children who did not eat high-energy food (fried food, western fast food), excessive eating behavior (scores of satiety responsiveness, scores of emotional over-eating scores) |
| Screen viewing behavior | Yes | No | Yes | An updated version of a previously validated screen viewing questionnaire [5] | Once | | Time spent on screen viewing [6] |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Physical activity (together with parents) | Yes | No | Yes | An item self-reported by parents[4] | Once | Parents were asked to fill in the questionnaire. | Number of days performing physical activity together with parents |
| Self-reported moderate-to-vigorous physical activity | Yes | No | Yes | An updated version of a previously validated Youth Risk Behavior Survey questionnaire [3] | Once | Children finished the questionnaires in the classroom in the presence of the trained outcome assessors who can provide guidance and help. | Number of days performing moderate-to-vigorous physical activity ≥1 hour per week (this cut-off was defined based on "Global Recommendations on Physical Activity for Health" [4]) |
| **Obesity-related knowledge** | | | | | | | |
| Obesity-related knowledge | Yes | No | Yes | Items designed based on the key messages of health education activities [5] | Once | Children finished the questionnaires in the classroom in the presence of the trained outcome assessors who can provide guidance and help. | Scores of obesity-related knowledge |
| **Physical fitness** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| One-minute rope jump | Yes | No | Yes | Not applicable | Once | Measured to unit of number | Number of rope jumps within one minute |
| One-minute sit-up | Yes | No | Yes | Not applicable | Once | Measured to unit of number | Number of sit-ups within one minute |
| Long standing jump | Yes | No | Yes | Not applicable | Third[6] | Measured to the nearest 1 cm | Distance of long standing jump |
| Shuttle run (50 m ×8) | Yes | No | Yes | Not applicable | Once | Measured to the nearest 0.1 s | Duration of shuttle run (50 m×8) |
| **Blood pressure** | | | | | | | |
| Systolic and diastolic blood pressures | Yes | Yes | Yes | Electronic sphygmomanometer (Omron HBP-1300) | Twice (third measure if difference >5 mmHg)[7] | Measured to the nearest 1 mmHg | Systolic blood pressure, diastolic blood pressure |

1 Where two values were ≤ 0.5 cm, a definitive measurement value was calculated as the average of the two. For individuals with three values recorded, a definitive measurement value was calculated as average of the closest pair or average of all three readings (if there were no two closest readings). 2 Where two values were ≤ 0.1 kg, a definitive measurement value was calculated as the average of the two. For individuals with three values recorded, a definitive measurement value was calculated as average of the closest pair or average of all three readings (if there were no two closest readings). 3 Where two values were ≤ 1.0 cm, a definitive measurement value was calculated as the average of the two. For individuals with three values recorded, a definitive measurement value was calculated as average of the closest pair or average of all three readings (if there were no two closest readings). 4 Parents were asked *"How many days did parents take their children to exercise together in the past 7 days?"* 5 For example, children were asked "*Is it correct that drinking sugar-sweetened beverage cannot substitute drinking water*?" and three choices were provided (*"correct"; "wrong"; "unknown"*). Children who chose "correct" would be given 1 score, and those choosing "wrong" or "unknown" would be given 0 score. 6 A definitive measurement value was obtained from the maximum of the three measurements. 7 Where two values were ≤ 5 mmHg, a definitive measurement value was calculated as the average of the two. For individuals with three values recorded, a definitive measurement value was calculated as average of the closest pair or average of all three readings (if there were no two closest readings). ⁎All instruments used in this study can be shared with investigators by reasonable request via contacting the corresponding author.

**eTable 4. Comparison of Children Included in the Primary Outcome Analysis (n=1362) and Those Lost to Follow-up (n=30) by Baseline Characteristics**

| | Children included in primary outcome analyses (n = 1362) | Children without follow-up assessment (n = 30) |
|---|---|---|
| **Group allocation, n (%)** | | |
| Intervention group | 686 (50.4) | 19 (63.3） |
| Control group | 676 (49.6) | 11 (36.7) |
| **Region, n (%)** | | |
| Beijing | 476 (34.9) | 16 (53.3) |
| Changzhi of Shanxi | 396 (29.1) | 4 (13.3) |
| Urumuqi of Xinjiang | 490 (36.0) | 10 (33.3) |
| **Sex, n (%)** | | |
| Male | 704 (51.7) | 13 (43.3) |
| Female | 658 (48.3) | 17 (56.7) |
| **Weight status, n (%)** | | |
| Underweight | 65 (4.8) | 1 (3.3) |
| Normal weight | 735 (54.0) | 18 (60.0) |
| Overweight | 236 (17.3) | 8 (26.7) |
| Obese | 326 (23.9) | 3 (10.0) |

| | | |
|---|---|---|
| **Primary caregiver, n (%)*** | | |
| Parents | 1297 (95.6) | 10 (90.9) |
| Non-parents | 59 (4.4) | 1 (9.1) |
| **Maternal education, n (%)#** | | |
| Hight school or below | 537 (41.3) | 12 (42.9) |
| Above high school | 762 (58.7) | 16 (57.1) |
| **Mean age (SD), year** | 9.6 (0.6) | 9.5 (0.4) |
| **Mean height (SD), cm** | 139.9 (6.5) | 138.7 (6.4) |
| **Mean weight (SD), kg** | 36.9 (9.5) | 34.3 (8.5) |
| **Mean BMI (SD), kg/m$^2$** | 18.6 (3.7) | 17.7 (3.2) |
| **Mean BMI Z-score (SD)** | 0.7 (1.4) | 0.4 (1.4) |

* Missing values: 25; # Missing values: 65

**eTable 5. Intervention Effects on Secondary Outcomes at Middle of Intervention**

| Secondary outcomes | N* | Intervention group | | Control group | | Comparison between groups (intervention versus control) | |
|---|---|---|---|---|---|---|---|
| | | Mean (SD)/n (%) at baseline | Mean (SD)/n (%) at 4 months | Mean (SD)/n (%) at baseline | Mean (SD)/n (%) at 4 months | Adjusted mean difference/ OR (95% CI)[Δ] | *P* value |
| **Continuous outcomes** | | | | | | | |
| BMI, kg/m$^2$ | 703/670 | 18.51 (3.68) | 18.40 (3.82) | 18.73 (3.72) | 18.90 (3.94) | -0.27 (-0.48, -0.06) | 0.011 |
| BMI Z-score | 703/670 | 0.69 (1.43) | 0.55 (1.42) | 0.78 (1.45) | 0.75 (1.44) | -0.11 (-0.19, -0.03) | 0.005 |
| Waist circumference, cm | 702/669 | 65.0 (10.2) | 63.7 (10.2) | 65.6 (11.1) | 65.7 (10.6) | -1.58 (-2.78, -0.38) | 0.010 |
| Waist-to-hip ratio | 702/669 | 0.86 (0.06) | 0.83 (0.06) | 0.86 (0.06) | 0.85 (0.09) | -0.01 (-0.03, 0.001) | 0.072 |
| Systolic blood pressure, mmHg | 702/670 | 103.3 (9.9) | 104.7 (10.7) | 102.8 (9.3) | 106.9 (10.4) | -2.53 (-4.68, -0.37) | 0.021 |
| Diastolic blood pressure, mmHg | 702/670 | 58.7 (6.8) | 59.2 (7.6) | 58.1 (6.9) | 59.7 (7.1) | -0.68 (-2.19, 0.84) | 0.383 |
| **Binary outcomes** | | | | | | | |
| Obese | 703/670 | 159 (22.6%)[c]<br>139 (19.8%)[w] | 130 (18.5%)[c]<br>118 (16.8%)[w] | 163 (24.3%)[c]<br>152 (22.7%)[w] | 156 (23.3%)[c]<br>141 (21.0%)[w] | 0.49 (0.26, 0.94)[c]<br>0.65 (0.37, 1.14)[w] | 0.030[c]<br>0.136[w] |
| Overweight or obese | 703/670 | 271 (38.5%)[c]<br>297 (42.2%)[w] | 233 (33.1%)[c]<br>267 (38.0%)[w] | 293 (43.7%)[c]<br>305 (45.5%)[w] | 286 (42.7%)[c]<br>301 (44.9%)[w] | 0.43 (0.26, 0.73)[c]<br>0.51 (0.30, 0.85)[w] | 0.002[c]<br>0.010[w] |

[*] The number before "/" refers to that of the intervention group, and the number after "/" refers to that of the control group.
[Δ] Generalized linear mixed models allowing for the school-clustering effect were used to analyze outcomes, with adjustment for baseline values of the outcomes, age, and sex of the children.
Abbreviations: BMI = body mass index; SD = standard deviation; OR = odds ratio; CI = confidence interval.
[C] Overweight/obesity was defined by using age- and sex-specific BMI cut-offs according to Chinese national screening criteria; [w] Overweight/obesity was defined by BMI Z-score ≥ 1 or ≥ 2 according to WHO growth reference.

**eTable 6. Intervention Effects on Remission of Overweight/Obesity at Middle and End of the Intervention**

| Secondary outcomes | Definition | N (Intervention/Control) | Intervention group n (%) | Control group n (%) | Adjusted OR (95% CI)[Δ] | *P* value |
|---|---|---|---|---|---|---|
| **Obese** | | | | | | |
| Remission cases at mid | Chinese cutoffs [c] | 159/163 | 34 (21.4) | 20 (12.3) | 3.20 (0.96, 10.70) | 0.058 |
| | WHO [w] | 139/152 | 26 (18.7) | 21 (13.8) | 1.91 (0.83, 4.38) | 0.129 |
| Remission cases at end | Chinese cutoffs [c] | 158/168 | 45 (28.5) | 24 (14.3) | 4.95 (1.53, 16.06) | 0.008 |
| | WHO [w] | 138/157 | 40 (29.0) | 25 (15.9) | 5.18 (2.26, 11.87) | <0.001 |
| **Overweight or obese** | | | | | | |
| Remission cases at mid | Chinese cutoffs [c] | 271/293 | 48 (17.7) | 22 (7.5) | 5.34 (2.69, 10.59) | <0.001 |
| | WHO [w] | 297/305 | 42 (14.1) | 21 (6.9) | 2.48 (1.40, 4.40) | 0.002 |
| Remission cases at end | Chinese cutoffs [c] | 266/296 | 59 (22.2) | 37 (12.5) | 3.90 (2.03, 7.54) | <0.001 |
| | WHO [w] | 291/305 | 57 (19.6) | 33 (10.7) | 2.59 (1.51, 4.44) | 0.001 |

[Δ] Generalized linear mixed models allowing for the school-clustering effect were used to analyze outcomes, with adjustment for baseline values of BMI Z-score, age, and sex of the children.
[C] Overweight/obesity was defined by using age- and sex-specific BMI cut-offs according to Chinese national screening criteria.
[w] Overweight/obesity was defined by BMI Z-score ≥ 1 or ≥ 2 according to WHO growth reference.
Abbreviations: OR = odds ratio; CI = confidence interval.

**eTable 7. Intervention Effects on Incidence of Overweight/Obesity at Middle and End of the Intervention**

| Secondary outcomes | Definition | N (Intervention/Control) | Intervention group n (%) | Control group n (%) | Adjusted OR (95% CI)[Δ] | *P* value |
|---|---|---|---|---|---|---|
| **Obese** | | | | | | |
| New cases at mid | Chinese cutoffs [c] | 544/507 | 5 (0.9%) | 12 (2.4%) | 0.40 (0.05, 2.95) | 0.369 |
| | WHO [w] | 564/518 | 5 (0.9%) | 10 (1.9%) | 0.48 (0.10, 2.39) | 0.370 |
| New cases at end | Chinese cutoffs [c] | 528/508 | 2 (0.4%) | 15 (3.0%) | 0.14 (0.01, 2.31) | 0.167 |
| | WHO [w] | 548/519 | 4 (0.7%) | 12 (2.3%) | 0.32 (0.06, 1.73) | 0.185 |
| **Overweight/obese** | | | | | | |
| New cases at mid | Chinese cutoffs [c] | 432/377 | 10 (2.4%) | 15 (4.0%) | 0.45 (0.02, 8.77) | 0.601 |
| | WHO [w] | 406/365 | 12 (3.0%) | 17 (4.7%) | 0.56 (0.09, 3.54) | 0.540 |
| New cases at end | Chinese cutoffs [c] | 420/380 | 8 (1.9%) | 12 (3.2%) | 0.49 (0.02, 12.84) | 0.671 |
| | WHO [w] | 395/367 | 10 (2.5%) | 12 (3.3%) | 0.71 (0.09, 5.57) | 0.744 |

[Δ] Generalized linear mixed models allowing for the school-clustering effect were used to analyze outcomes, with adjustment for baseline values of BMI Z-score, age, and sex of the children.
[C] Overweight/obesity was defined by using age- and sex-specific BMI cut-offs according to Chinese national screening criteria.
[w] Overweight/obesity was defined by BMI Z-score ≥ 1 or ≥ 2 according to WHO growth reference.
Abbreviations: OR = odds ratio; CI = confidence interval.

**eTable 8. Outcomes of Adverse Events at the End of the Intervention**

| Indicators of adverse events | N* | Intervention group<br>n (%)/mean (SD) | Control group<br>n (%)/mean (SD) | Adjusted OR<br>or mean difference (95% CI)Δ | *P* value |
|---|---|---|---|---|---|
| Body image dissatisfaction | 681/665 | 506 (74.3%) | 472 (71.0%) | 1.20 (0.92, 1.58) | 0.183 |
| Becoming underweight | 652/645 | 24 (3.7%) | 12 (1.9%) | 1.66 (0.71, 3.85) | 0.239 |
| Height, cm# | 686/676 | 144.8 (6.9) | 144.6 (7.1) | 0.06 (-0.17, 0.28) | 0.632 |

* The number before "/" refers to that of the intervention group, and the number after "/" refers to that of the control group.

# We compared the increase of height between two groups, in order to find whether there was less height growth in the intervention group compared with the controls.

Δ Generalized linear mixed models allowing for the school-clustering effect were used to analyze outcomes, with adjustment for baseline values of the outcomes, age, and sex of the children.

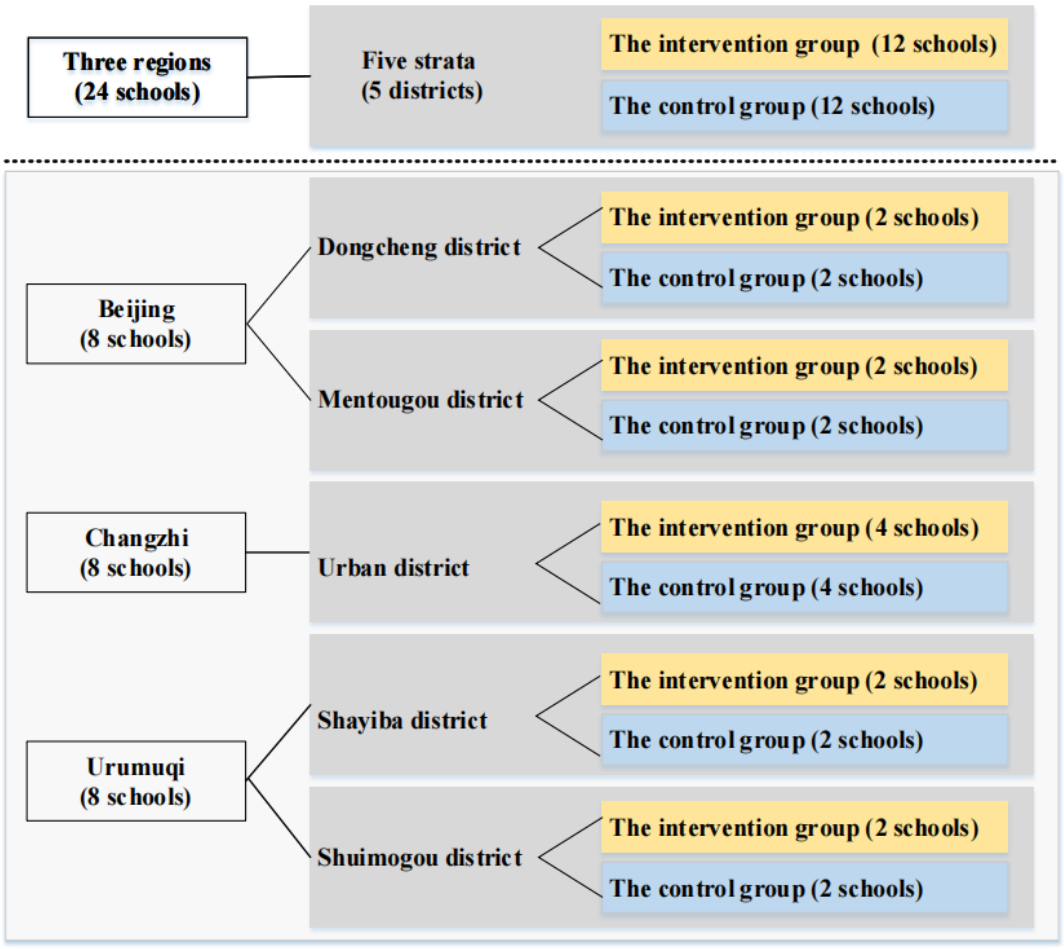
**eTable 9. Implementation of the Multifaceted Intervention Components**

| Intervention components | Implementation |
|---|---|
| **Three components targeting children** | |
| Health education | Each school in the intervention group completed this activity as planned (a total of 10 activities per school) and the attendance rate for each activity was above 99.9% among all schools in the intervention group; posters and slogan banners on campus were 100% delivered as planned (a total of 4 times per school). |
| Reinforcement of physical activity | Schools in the intervention group could achieve one hour of physical activity for a median of 83% (range: 62-97%) school days. Among the three types of physical activities delivered, 88% , 84%, and 58% of physical education classes, extracurricular activities, and class-break exercise could achieve moderate-to-vigorous intensity, respectively. |
| BMI monitoring and feedback | (1) Each school in the intervention group completed the monthly monitoring as planned (a total of 6 times per school), and children's attendance rates were stable across all time points in all schools (range: 92%-100%); (2) schools in the intervention group planned to complete the weekly monitoring for 24 times, and completed this activity for an average of 17.5 (range: 9-24) times. |
| **Engaging schools to support children's behavioral changes** | |
| School policies supporting obesity prevention | All schools (100%) in the intervention group implemented the policy of not selling unhealthy snacks or sugar-sweetened beverages within school, 66.7% (8/12) implemented the policy of not eating unhealthy snacks or sugar-sweetened beverages within school, and 66.7% (8/12) implemented the policy of not buying unhealthy snacks or sugar-sweetened beverages around school. |
| Health education for school teachers | All schools (100%) in the intervention group completed the health education as planned and a median of 5 (range: 1-13) teachers per school in the intervention group attended this activity. |
| **Engaging families to support children's bahavioral changes** | |

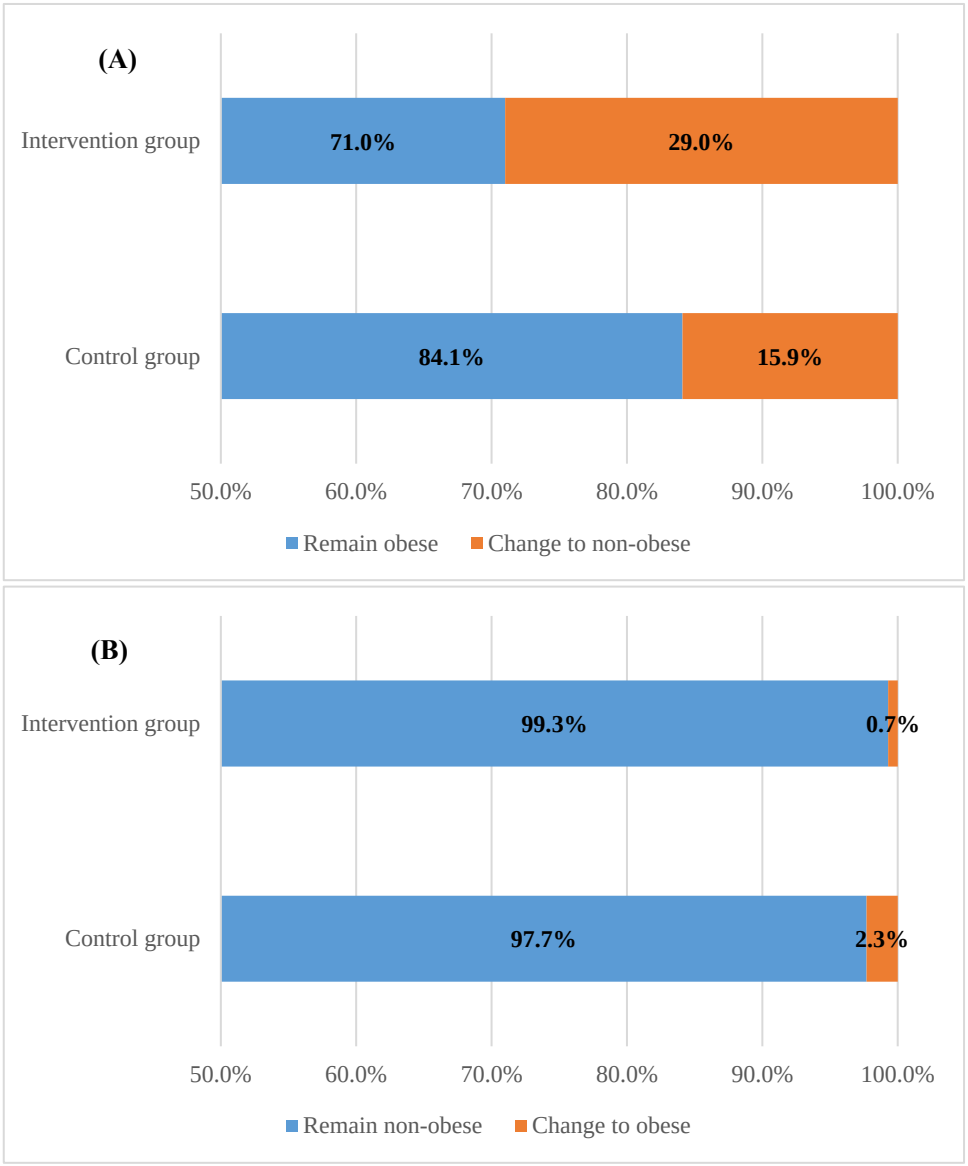
| | |
|---|---|
| Health education for parents | Each school in the intervention group completed this activity as planned (a total of 3 activities per school) and the average attendance rate for each activity was 87.1% among all schools in the intervention group. |
| Reinforcement of children's physical activity outside school | Parental self-reported results showed that 2.0% "never", 4.4% "very little", 27.3% "sometimes", 49.3% "often", and 17.1% "always" encouraged children's physical activity outside school. |
| Supporting children to manage body weight | (1) Recording behaviors of the children: 99.7% of parents recorded behaviors of the children for a median (IQR) of 25 (16-33) times, spending a median (IQR) of 49 (37-63) seconds per time; (2) Tracking BMI of the children: 98.2% of parents used this function for a median of 14 (8-23) times, spending a median (IQR) of 17 (11-26) seconds per time. * |

Abbreviation: BMI=body mass index; IQR=inter-quartile range. * Parents should record behaviors for a total of 36 times, and track BMI for at least 6 times; they could also view BMI of the children any time.

**eFigure 1. Random Allocation of Schools to the Intervention or Control Group Within 5 Districts (Strata)**

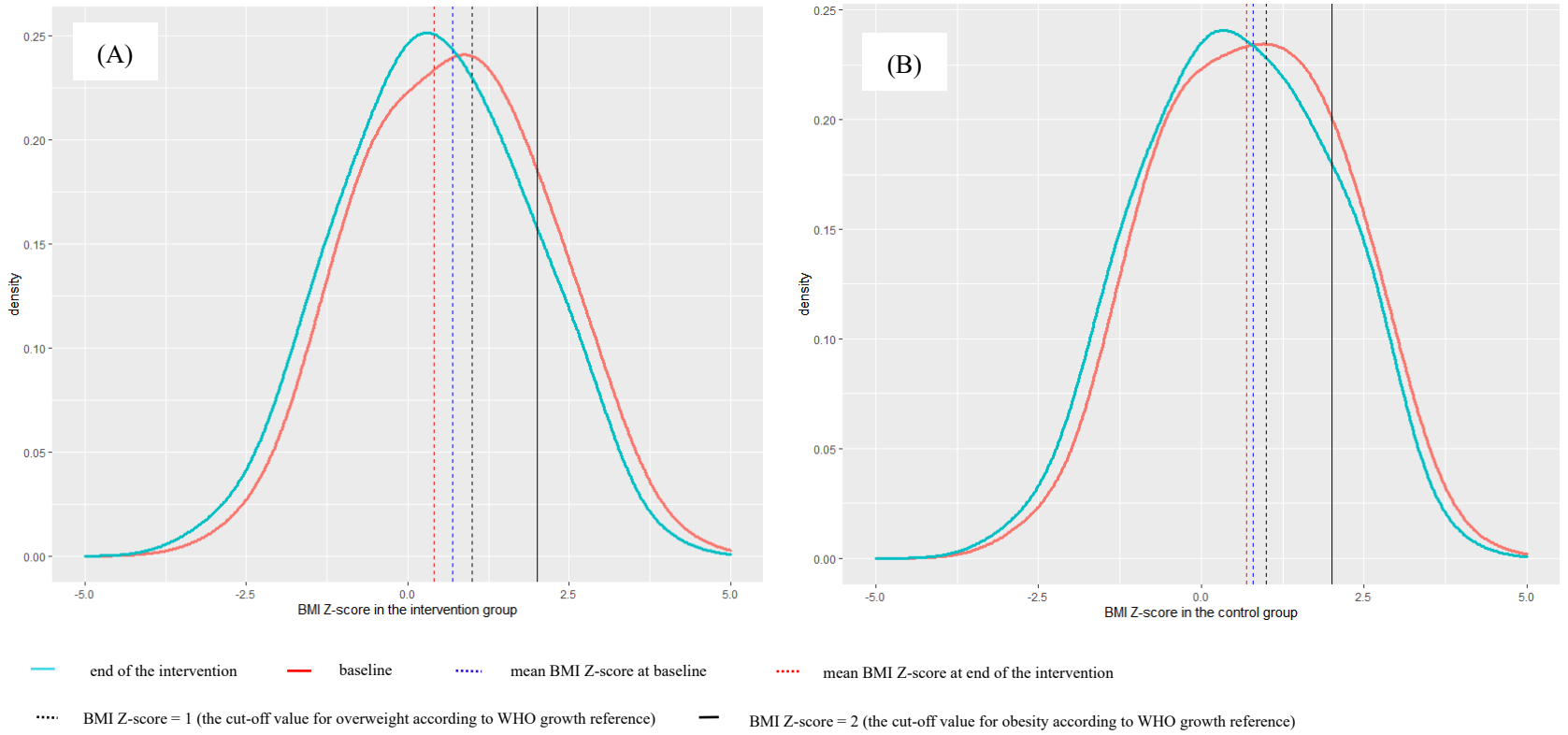


**eFigure 2. The Remission and Incidence of Obesity in the Intervention and Control Groups**




(Figure (A) shows the remission of obesity in the intervention and control groups at the end of trial; figure (B) shows the incidence of obesity in the intervention and control groups at the end of trial; obesity was defined by using age- and sex-specific BMI cut-offs according to Chinese national screening criteria.)

**eFigure 3. The Distribution of BMI *z* Score at Baseline and End of the Intervention in the Intervention (A) and Control (B) Groups**



## eReferences


1 de Onis M, Onyango A, Borghi E, Siyam A, Nishida C, Siekmann J. Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*, 2007, 85: 660-667.

2 National Health Commission of the People's Republic of China. Screening for overweight and obesity among school-age children and adolescents (WS/T 586-2018). Beijing, China; 2018.

3 Brener ND, Kann L, McManus T, et al. Reliability of the 1999 youth risk behavior survey questionnaire. *J Adolesc Health* 2002; **31**: 336–42.

4 Global Recommendations on Physical Activity for Health. Geneva: World Health Organization 2010.

5 Robinson TN. Reducing children's television viewing to prevent obesity: a randomized controlled trial. *JAMA* 1999; **282**: 1561–7.

6 American Academy of Pediatrics: Children, adolescents, and television. *Pediatrics* 2001; **107**: 423–6.

7 Hunsberger M, O'Malley J, Block T, et al. Relative validation of Block Kids Food Screener for dietary assessment in children and adolescents. *Matern Child Nutr* 2015; **11**: 260–70.

8 Wardle J, Guthrie CA, Sanderson S, et al. Development of the children's eating behaviour questionnaire. *J Child Psychol & Psychiat* 2001; **42**: 963–70.

9 Sarkin JA, Johnson SS, Prochaska JO, Prochaska JM. Applying the transtheoretical model to regular moderate exercise in an overweight population: validation of stages of change measure. *Prevention Medicine* 2001; **33**: 462–9.