A systematic review and meta-analysis of intervention for pediatric obesity using mobile technology

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Introduction
Introduction

- Overweight or obese children are at great risk of diseases such as diabetes and metabolic syndrome, and are also affected psychosocially.

- The obesity rate of elementary school students in Korea (based on body mass index [BMI]) is 20.6%, and 32% of those aged 2–19 years in the United States are overweight or obese (Ng et al, 2014).
Introduction

- Additionally, smartphone ownership rates are increasing among children, with 72.2% of elementary school students in Korea and 68% of children aged 13–14 in the U.S. owning a smartphone (Lenhart, 2015).

- To effectively manage pediatric obesity, some interventions have utilized mobile technology (Niet et al., 2012) (Huang et al., 2014) (Nollen et al., 2014).
“I am wondering...”
Methods
PICO for the more specific questions

Who is the patient, or **Population**, your question is focusing on?
- Elementary school student with Obesity

What kind of **intervention** you are looking at?
- Mobile technology

Comparison
- Experiment group VS control group

**Outcome**: What is the outcome you are looking for
- Weight or behavior change
Time
- Pre- and post-test studies

Setting
- Any

Study Design
- Randomized Controlled Trial

PICOTS-SD for more detail
“whether a intervention using mobile technology, intervention
is effective in managing obesity, outcome
in elementary school student, population”
# Inclusion and exclusion criteria

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
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<tbody>
<tr>
<td>Studies with abstract and full text</td>
<td>Target only parents</td>
</tr>
<tr>
<td>English or Korean</td>
<td>For normal students</td>
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<tr>
<td>Pre- and post-test studies</td>
<td></td>
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<tr>
<td>Using smartphone or mobile technology</td>
<td></td>
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<tr>
<td>Elementary school students</td>
<td></td>
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<tr>
<td>Conducted with parents are also included</td>
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</table>
Literature sources and search strategy

- **Search terms**
  - **Child**
    - Children
    - Childhood
    - Pediatric
  - **Smartphone**
    - Mobile phone
    - Cell phones
  - **Obesity**
    - Obese
    - Overweight
    - Pediatric obesity

- **Publication year**: After January 2007

- **10 Search DB**: Cochrane CENTRAL, PubMed/Medline, CINAHL, EMBASE, KISS, KoreaMED, KMBASE, NDSL, KSITI, and RISS.

- An additional 8 studies were found manually.
Study selection

#268 of records identified through database searching

#8 of additional records identified through other sources

#83 duplicates removed

#193 of records included for title and abstract review

#151 of records excluded on title and/or abstract

#42 of full-text articles assessed for eligibility

#4 of studies included in qualitative synthesis

#4 of studies included in quantitative synthesis (meta-analysis)

#38 of full-text articles excluded due to not meeting include criteria
Study classification

Non-Comparative Study
- e.g., Case series
- Focus group
- Case study
- Descriptive type study

Cross-sectional

Comparison between exposed and unexposed?
- Yes
- No

Exposure and outcome determined in the same population at the same time?
- Yes
- No

Multiple measurements made before, during or after intervention?
- Yes
- No

Before-After

More than one group studied?
- Yes
- No

Randomized trial

Group randomized trial

Exposure assigned at group level? (e.g., community, county, clinic)
- Yes
- No

Non-randomized trial (Groups or individuals)

Outcome defined by?
- Yes
- No

Case-Control

Groups defined by?
- Yes
- No

Prospective Cohort Study

Prospective

Cohort Design?
- Yes
- No

Retrospective Cohort Study

Other designs with concurrent comparison groups (e.g., time series study with comparison group)
Data extraction and Data synthesis

- Data extraction was completed independently by two researchers with Excel 2013.
- Disagreements were resolved through discussion.
- Relevant data on study design and variables were summarized.
- Qualitative and quantitative syntheses were conducted using Comprehensive Meta-Analysis software.
Results
<table>
<thead>
<tr>
<th>Reference</th>
<th>Sample</th>
<th>Research Design /Duration +Used device</th>
<th>Intervention</th>
<th>Control</th>
<th>Obesity-related Outcomes</th>
<th>Dropout</th>
</tr>
</thead>
</table>
| J. R. Shapiro et al. (2008)       | n = 58  
(SMS = 18; PD = 18; C = 22) | Three-group RCT, pre- and post-test /2 months  
+phone  
+pedometer | Educational group sessions weekly for 3 weeks with parents  
Sending 2 SMS per day  
(one for parent and one for child) receiving an automated SMS feed back message | PD group: self-monitoring forms to record the 3 behaviors daily for both parent and child, turned in their forms at each session, and received weekly verbal feedback.  
Control group: Participated in the 3 intervention sessions | Physical activity  
SSB  
screen time  
treatment acceptability  
Attrition  
self-monitoring preliminary efficacy | 27(46.6%)  
(SMS = 5; PD = 11; C = 11) |
| J. de Niet et al. (2012)           | n = 141  
(SMSMT = 73; C = 68) | Two-group RCT, pre- and post-test /9 months  
+phone | Follow group sessions every 3 months with parents sent weekly self-monitoring data on exercise and eating behavior and their mood by SMS, and received tailored feedback messages | Standard care | BMI  
eating behaviors  
psychological well-being | 33(23.4%)  
(SMSMT = 12; C = 21) |
| J. S. Huang et al. (2014)          | n = 38  
(Fit4Life = 19; C = 19) | Two-group RCT, pre- and post-test /4 months  
+ phone  
+accelerometer | Received weekly materials via an Internet program outlining weight management, tailored SMS messages and queries were delivered twice per day, and weekly counseling calls | Once a month, parents and youth received printed weight management materials | Weight  
health behaviors  
cardio metabolic  
psychological outcomes | 3(7.9%)  
(Fit4Life = 1; C = 2) |
| N. L. Nollen et al. (2014)         | n = 51  
(MT = 26; C = 25) | Two-group RCT, pre- and post-test /3 months  
+Mypal A626 instead of phone | Goal-setting and planning of setting two daily goals self-monitor progress toward their goals at five preselected times throughout the day | Received manuals at Weeks 1–4 (FV); 5–8 (SSB); and 9–12 (screen time).  
BMI  
SSBs  
screen time | 7(13.8%)  
(MT = 3; C = 4) |
Qualitative Synthesis

- Three studies were included for computing BMI effect size. Mobile intervention had no significant effect on BMI (Hedges’ g: -0.073, 95% CI: -0.031 to 0.185). Additionally, two studies were examined for the effect size of daily exercise and sugar-sweetened beverage intake; neither showed any significant effect (Hedges’ g: 0.189, 95% CI: -0.355 to 0.733; Hedges’ g: -0.316, 95% CI: -0.764 to 0.131).
Qualitative Synthesis

- Dropout rates were considered as potential mediators of intervention outcome. Mobile intervention was effective for controlling dropout rates (Odds ratio: 0.363, 95% CI: 0.178 to 0.74).
Discussion
Qualitative Synthesis – Common characteristics

Four RCT Studies
- Intervention group attrition rates were lower

Three RCT Studies
- Parents’ participation, text messaging was used

Two RCT Studies
- Add a pedometer or accelerometer to mobile technology.
Limitation

● The sample size is not enough to find out the relative effectiveness.

● We recommend additional systematic review and meta-analysis after further studies performed to verify the indicators which can maximize the outcome.
Thank You!
Any Question?

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