Mobile health (mHealth) applications with children in treatment for obesity: A randomised feasibility study

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Mobile health (mHealth) applications with children in treatment for obesity: A randomised feasibility study

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Submitted on behalf of members of the H2020 BigO Project.

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Background

The W82GO Service delivers evidence-based obesity treatment to families of children and adolescents with obesity (BMI>98th percentile) and has a positive impact on obesity[1]. Smartphone mHealth apps can augment treatment by helping children with obesity to reduce rate of eating and monitor physical activity[2, 3].

Aim

To evaluate, using a randomised design, the feasibility and acceptability of a mHealth intervention to reduce eating rate and track physical activity among children in treatment for obesity.

Methods

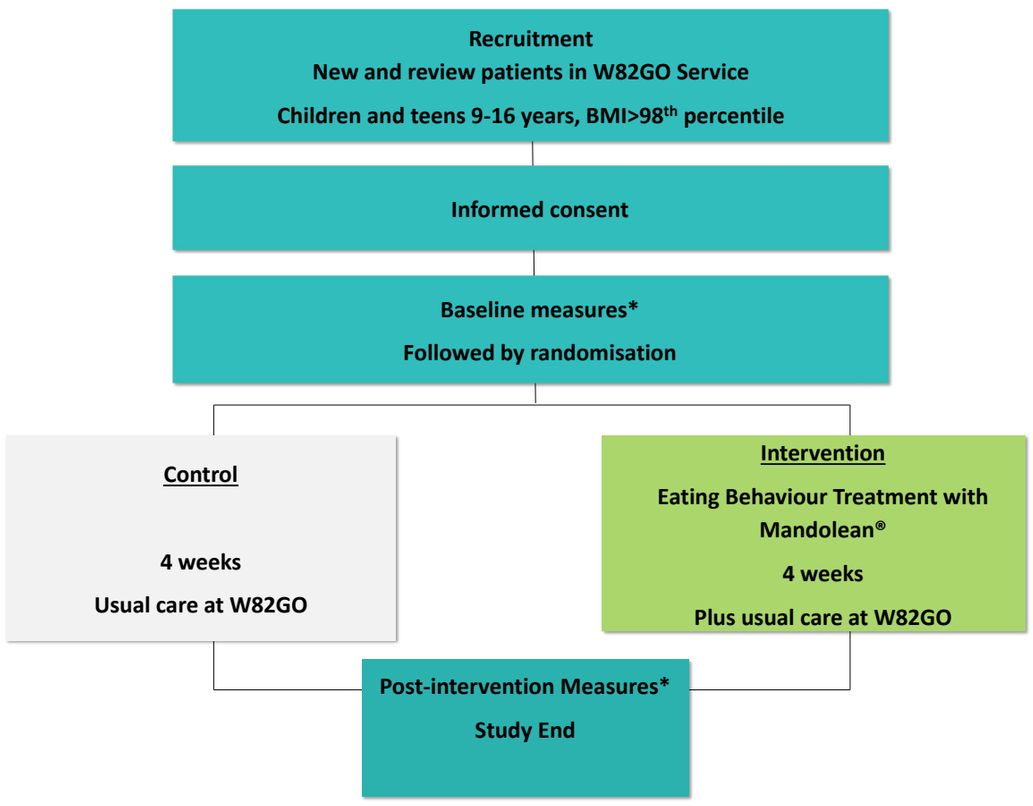


Figure 1: Clinical study protocol for mHealth intervention among children in treatment for obesity.

***Baseline & post-intervention measures:** anthropometry, questionnaires (Parent CBCL, Child Peds QL, Child Piers-Harris), rate of eating using Mandolean®, physical activity levels with smartwatch and myBigO app.

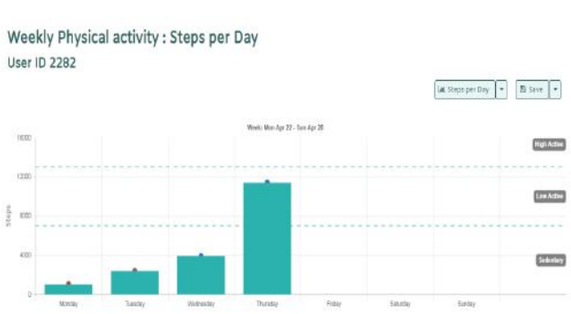
Process Measures:

- **Feasibility:** recruitment and retention.
- **Fidelity:** adherence to randomisation and study procedures.
- **Acceptability:** objective measures of app engagement, system usability scale (SUS) surveys and verbal feedback.

Ethical permission: granted by the research ethics committee at Children's Health Ireland, Temple St., Dublin.

The Mandolean® plate scales connects to a smartphone app to record rate of eating. For the intervention, the clinician sets a training curve which is visible to patients on their phone screens during meal times.

myBigO app tracks physical activity via smartwatches worn by participants. Activity and step count data is viewed by clinicians via a clinical portal.



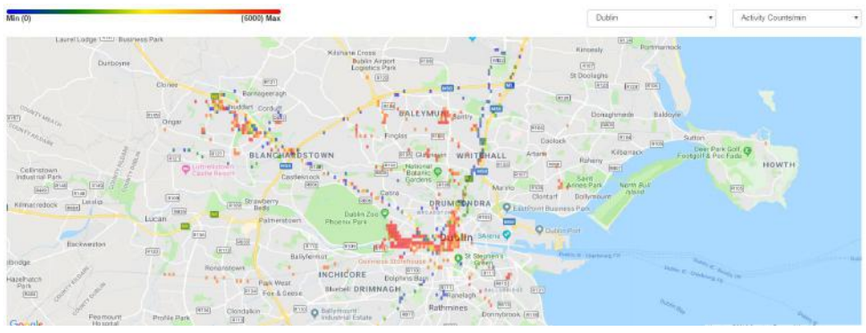
Results

Table 1: Participant characteristics and Child Behaviour Checklist (CBCL) results at baseline

PARTICIPANT CHARACTERISTICS & BASELINE MEASURES	INTERVENTION n 8	CONTROL n 12	COMPLETED STUDY n 13	DID NOT COMPLETE n 8
Male / female n	3 / 5	6 / 6	4 / 8	5 / 3
Mean age, years	13.1±2.3	13.5±2.3	13.3±2.7	13.5±1.5
Baseline BMI, kg/m^{-2}	31.6±3.9	33.2±5.9	32.16±5.7	33.1±4.6
Baseline BMI SDS (SD)	3.02±0.27	3.04±0.60	3.00±0.56	3.09±0.37
BASELINE CBCL (PARENT REPORT)				
Child Behaviour Checklist (CBCL) Total T-score	71.7±3.1*	57.6±6.6*	59.0±9.3**	67.9±5.6**
• Externalising behaviour T-score mean±SD	67.8±4.7*	57.2±7.8*	58.2±7.5	65.0±8.7
• Internalising behaviour T-score mean±SD	64.3±6.2*	53.8±8.5*	56.1±9.5	60.3±9.2

** Mean T-score score significantly different between intervention and control groups at baseline (p<0.05)*
• CBCL T-scores ≥67 indicate a high risk of behavioural/emotional problems
*** Mean T-score at baseline significantly different between participants who completed the study and non-completers (p<0.05)*

The BigO eco-system creates heatmaps based on intensity of physical activity logged by smartwatch users.



90% wore smartwatch at baseline
30% wore smartwatch post-intervention
Low exposure post-intervention explained by:
Total attrition (n=8), Technical issues (n=3), Incompatible phone (n=2), Watch strap broke (n=1)

Feasibility

- 40% recruitment rate among eligible children and teenagers over 8 months
- 40% attrition
  - 63% of intervention
  - 25% of control

Fidelity

- 50% intervention group initiated Mandolean® training
- Average dose received: 10.8±6.6 training meals over 4 weeks Range: 7-93% of planned meals
- Attrition & poor engagement reduced planned intervention exposure

Acceptability

- Verbal feedback highlighted:
  - Technical issues at mealtimes.
  - Mandolean® an awkward process that interrupted flow of family meal
  - Incompatible with family routine/work for some.
  - Children and parents forget to use.

SUS Acceptability Measure

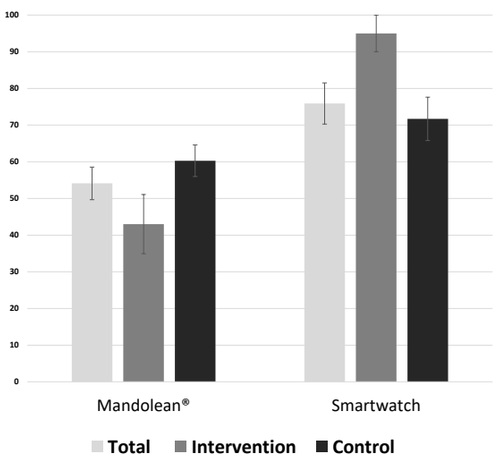


Figure 3 Mean System Usability Scale (SUS) scores for Mandolean® and Smartwatch with standard error bars categorised for total, intervention and control groups.
SUS score >68 considered above average acceptability

Figure 2: Summary of selected process measures arising from randomised feasibility study in terms of feasibility, fidelity and acceptability.

Conclusions

Results indicated that protocol amendments would be necessary for any future study and technical usability studies are needed to understand use in our patient group.

Future research should examine the influence of behaviour and emotional measures on study engagement and acceptability.

References
1. O'Malley et al. (2012) Obesity Facts. 5(S1):46
2. Ford et al.(2010)BMJ,340:b5388
3. Cooper et al.(2015)IJBNPA,12:113

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