Engaging disadvantaged mothers through mHealth to support infant feeding behaviours that promote healthy weight gain

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CERTIFICATE OF AUTHORSHIP/ORIGINALITY

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This research is supported by an Australian Government Research Training Program Scholarship.

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Abstract

Eating behaviours are learned from the beginning of life and it is these habits that are carried throughout the life stages, affecting weight gain. Parental feeding behaviours including early cessation of breast feeding, formula feeding, early introduction to solids and introduction to non-core foods are considered to be correlates of excess weight gain. Further, there are socio-economic disparities which coexist, where families from a lower socio-economic status (SES) are more likely to practise unhealthy feeding behaviours. It is essential to understand how to effectively encourage these parents to make healthier infant feeding decisions.

One emerging approach is to deliver health interventions through digital technologies also known as mobile health (mHealth). Interventions delivered through an mHealth approach have been shown to influence positive behaviour change in the management and prevention of chronic diseases. Yet there are very few studies which have developed mHealth interventions to support infant feeding. The research in which this thesis is embedded was designed to develop and test an mHealth intervention (the Growing healthy program) that delivers expert advice to mothers of young infants about healthy infant feeding behaviours.

This thesis includes a number of studies that were conducted to guide the development of the Growing healthy program and to evaluate the outcomes regarding participant engagement with the program and the uptake of healthy infant feeding behaviours. The Growing healthy program was a non-randomised quasi-experimental study delivered via a smartphone app and website providing advice and suggestions to guide infant feeding decisions for mothers. Firstly, a systematic analysis was conducted to explore the quality of infant feeding websites and apps that were available in 2014. The findings of this study highlighted the overall quality was poor and that apps and websites did not adhere to guidelines. In order for parents to receive trustworthy information, it is important that website and app developers merge user requirements with evidence-based content. The findings from this review of apps highlighted the lack of evidence based mHealth resources for parents and informed the development of the Growing healthy program.

The next study reported in this thesis is a qualitative study that was conducted with socioeconomically disadvantaged mothers of young infants. The purpose of the study was to explore mothers' interest in an mHealth program and features that would engage them to use a program. In addition, determinants associated with mothers' decision on timing of solid food introduction were also explored. The majority of the mothers, particularly primiparous mothers, expressed their interest in an mHealth program to provide infant feeding information. In this study we found that mothers' decisions with regards to solid introduction were mainly driven by their perception of their infants' readiness cues and several reported that they were provided with inconsistent advice on the infant feeding recommendations by health practitioners and from online information. The results informed the delivery and the content of the Growing healthy mHealth intervention.

The third study reported in this thesis describes the participation and engagement of the 225 participants who joined the Growing healthy app program including an analysis of the impact of the intervention on key outcomes; in particular the age at which solids were introduced. Both the participants' engagement level and the intervention's impact on timing of solid introduction were assessed by an Engagement Index which was developed by the candidate to suit the Growing healthy program. Participant engagement was higher amongst those who were primiparous, recruited through a health practitioner and who used both the app and accessed the weekly email. Conversely, participants who joined the program closer to three months of the infants' age, which resulted in less intervention time, were likely to have a lower engagement score. There was no significant association between the participants' engagement and the age they decided to introduce solids to their infant. The majority of the participants introduced solids when their infant was between four to five months of age.

Finally, a qualitative study with a subsample of 18 participants from the Growing healthy app program was conducted to explore their experience and the influence the program had on their decisions about the age of solid introduction. The participants' personal characteristics, the mode of delivery and the quality of the program all contributed to their engagement level. Participants who utilised the push notifications were more likely to access the app frequently and to have a higher engagement level,

while those who experienced technological issues had poor engagement with the app. With regards to the mothers' decisions on solid introduction, consistency in the advice participants were exposed to was the main driver of their decision. This influenced participants regardless of their engagement level with the app.

This thesis provides a unique contribution to the existing literature by reporting the findings of a feasibility study to support mothers with healthy infant feeding behaviours through an mHealth program. As well as being the first infant feeding program delivered through mHealth, it is also the first study to utilise an Engagement Index to measure participant engagement in an mHealth intervention. This work therefore provides valuable information to inform future trials regarding intervention components that enhance engagement among this demographic. The Engagement Index provides an effective method to analyse engagement that can be implemented and adapted to suit any mHealth intervention.

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In Loving Memory

Jeddo Mahmoud Taki

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List of Abbreviations

AAP	American Academy Pediatrics
ABA	Australian Breastfeeding Association
ALLS	Adult and Life Skills Survey
Apps	Applications
BCT	Behaviour Change Technique
BCW	Behaviour Change Wheel
BMI	Body Mass Index
CDC	Centre for Disease Control & Prevention
C_i	Click-Depth Index
CI	Confidence Interval
cm	Centimetre
COM-B	Capability, Opportunity, Motivation-Behaviour
DEECD	Department of Education and Early Childhood Development
EI	Engagement Index
EPOCH	Early Prevention of Obesity in CHildren
FAB	Food, Activity and Breastfeeding
F_i	Feedback Index
F-K	Flesch-Kincaid
HBM	Health Belief Model
HONcode	Health On Net Code of conduct
HRWEF	Health-Related Website Evaluation Form
I_i	Interaction Index
InFANT	Infant Feeding Activity & Nutrition Trial
IQR	Interquartile Range
IT	Information Technology
IOTF	International Obesity Task Force
kg	Kilogram
L_i	Loyalty Index
MARS	Mobile Application Rating Scale
MCH	Maternal and Child Health
mHealth	Mobile Health

m^2	Metre square
MRC	Medical Research Council
NHMRC	National Health Medical Research Council
NSW	New South Wales
OR	Odds Ratio
PHC	Primary Health Care
PIFI	Parent Infant Feeding Initiative
PN	Practice Nurses
QCSS	Quality Component Scoring System
R_i	Recency Index
RWG	Rapid Weight Gain
SAM	Suitability of Assessment Material
SEIFA	Socio-Economic Indexes for Areas
SCT	Social Cognitive Theory
SES	Socioeconomic Status
SD	Standard Deviation
SMOG	Simple Measure of Gobbledygook
SMS	Short Message Services
SPSS	Statistical Package for Social Sciences
TAFE	Technical and Further Education
TDF	Theoretical Domain Framework
TPB	Theory of Planned Behaviour
WHO	World Health Organization
WIC	Women, Infants, and Children