

Diabetes Management Mobile Applications

Behavior Change Theory and Evidence-Based Medicine

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Kitty Harding



Ogilvy Public Relations

Agenda

1. Background & Objectives
2. Methods
3. Results
4. Discussion
5. Conclusions & Recommendation

Background & Objectives

Background – Diabetes in the United States

- Affects 25.8 million people in the US – 8.3% of the population
- 7th leading cause of death in the US
- Major cause of stroke and heart disease^{1,2,3}
- Often controlled by diet, exercise, and medication
- Self-management education and self-care are vital^{4,5}



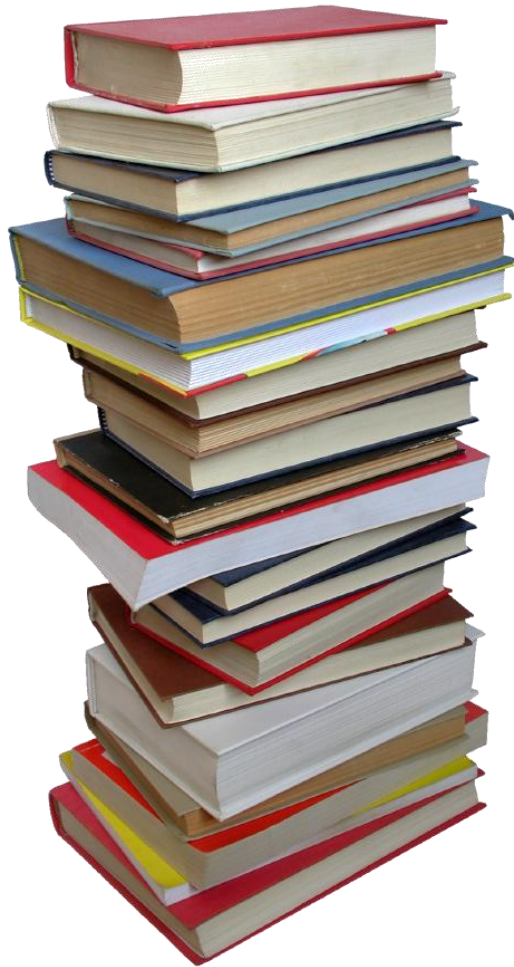
Objectives

Project Objective: Rate iTunes mobile applications for diabetes self-management against criteria to assess the use of behavior change theory and evidence-based guidelines



Methods

Literature Review – Diabetes Self-Management & Theory



- Diabetes Self-Management Behaviors ^{6,7}
 - Physical activity
 - Healthy eating
 - Medication taking
 - Monitoring blood glucose
 - Problem-solving
 - Reducing risk of diabetes complication
 - Psychosocial adaptation
- Behavioral Theories ^{8,9,10}
 - Theory of Planned Behavior
 - Health Belief Model
 - Social Cognitive Theory

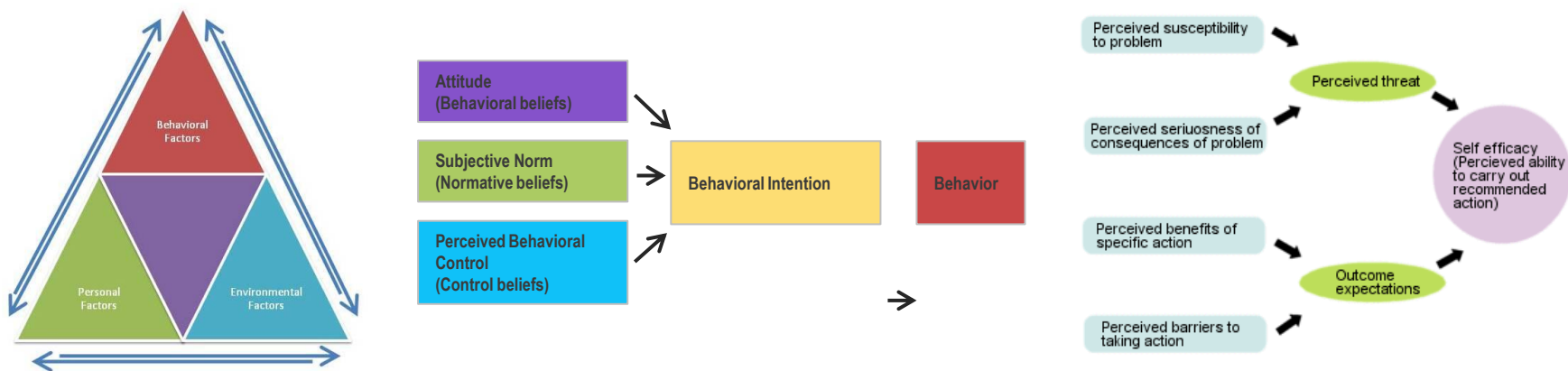
Literature Review – Mobile Usage & the State of the Science



- Cell phones and mobile app usage
 - 46% of US adults own a smartphone¹¹
 - 19% of smartphone owners have at least one health app on their phone
- State of the science
 - Texting interventions successful^{12,13}
 - Apps only studied for self-monitoring blood glucose^{14,15}

Codebook Development

- Codebook criteria developed based on literature review findings to rate inclusion of diabetes self-management behaviors and behavioral theory



- Final Codebook: 44 criteria – 31 self-management and 13 theory-based

Application Identification

- Identified diabetes self-management apps
 - 50 unique apps identified
- Eliminated 23 non-relevant apps
 - 9 not primarily meant for diabetes self-management
 - 3 diagnostic tools for healthcare providers
 - 3 insulin calculators
 - 2 iPad and iPhone versions identical
 - 1 failure to load content
 - 1 exclusively for gestational diabetes
 - 1 members only
 - 1 not in English
 - 1 outdated; directs users to a different app
 - 1 paid version same as free version
- 27 apps deemed relevant



Relevant Applications

Name	Platform	Type	Rating	Users	Cost (\$)
Bolus Bridge	iPhone & iPad	tracker	n/a	n/a	free
Daily Carb Premium	iPhone	tracker	2.5	11	2.99
Diabetes Management	iPhone	tracker	n/a	n/a	4.99
Diabetes Pal by Telcare	iPhone	tracker	4.5	23	free
Diabetes Self-Management Magazine	iPhone & iPad	education	3	15	free
Diabetes Management Database	iPhone	tracker	n/a	n/a	0.99
Diabetes Management Database Lite	iPhone & iPad	tracker	n/a	n/a	free
DiabetesTeam Lite	iPhone	tracker	n/a	n/a	free
dLife Diabetes Companion	iPhone	both	3	205	free
Glooko Logbook	iPhone	tracker	4.5	63	free
Glucose	iPhone	tracker	2.5	36	0.99
Glucose Buddy	iPhone	tracker	4.5	166	free
Glucose Companion iPad	iPad	tracker	4	8	1.99
Glucose Companion iPad free	iPad	tracker	4	10	free
Glucose Manager Patient	iPhone	tracker	n/a	n/a	3.99
iBGStar Diabetes Manager	iPhone	tracker	4	79	free
iFORA Diabetes Manager	iPhone	tracker	n/a	n/a	free
LogFrog DB	iPhone	tracker	4	5	2.99
Low GI Diet Tracker	iPhone & iPad	tracker	3	112	2.99
My Glu	iPhone	tracker	n/a	n/a	free
myDiabetes	iPhone	tracker	n/a	n/a	free
myMedtronic Connect	iPhone & iPad	education	2.5	8	free
Onsync	iPhone	tracker	n/a	n/a	free
Shot in the Arm	iPhone & iPad	education	5	5	free
WaveSense Diabetes Manager	iPhone	both	3.5	411	free
Your Diabetes Diary	iPhone & iPad	tracker	n/a	n/a	3.99
Your Life with Diabetes	iPhone & iPad	education	n/a	n/a	0.99

Ratings

- Identified and trained second coder
- Intercoder reliability
 - Coders blindly rated 5 randomly selected apps of the 27 total (18%)
 - The coders agreed completely on 33 of the 44 criteria
 - Items the coders disagreed on were functionality features of the apps and could be reconciled by the coders identifying its location within the app



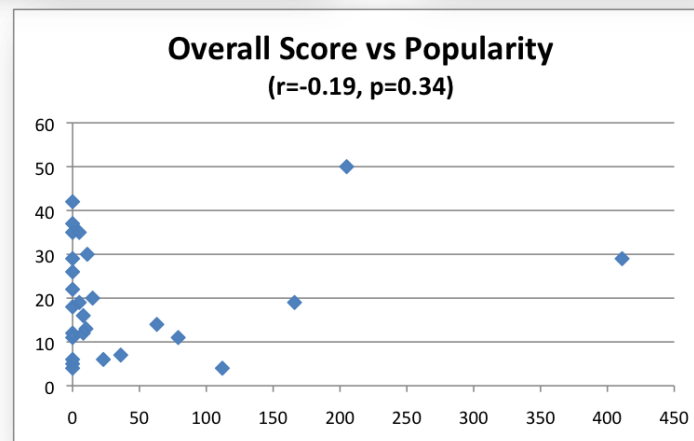
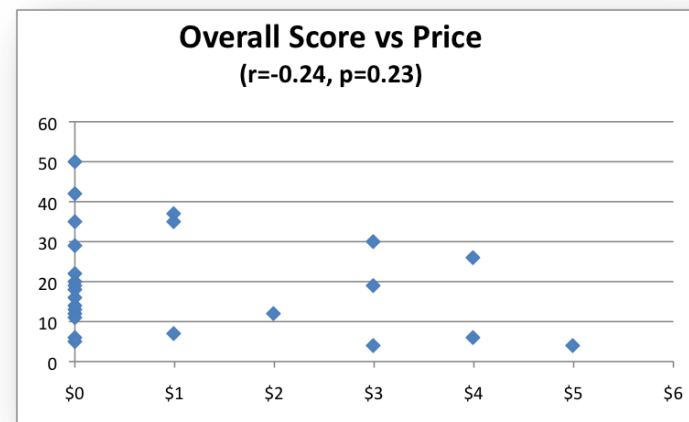
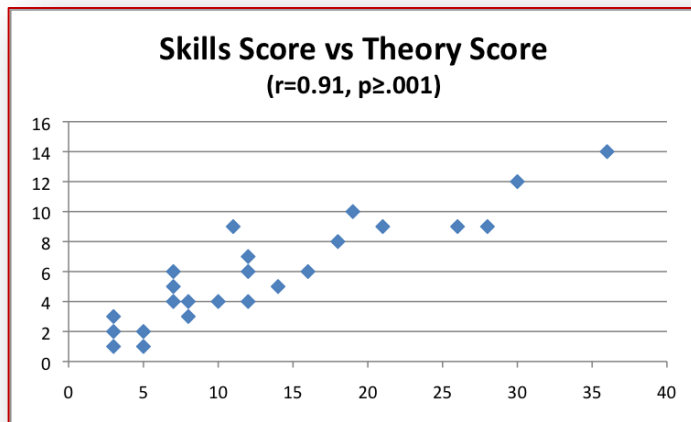
Results

Final Scores Low Across the Board

Application	Skills Score	Theory Score	Overall Score
dLife Diabetes Companion	36	14	50
myGlu	30	12	42
Diabetes Self-Management Magazine for iOS	28	9	37
Shot in the Arm	26	9	35
Your Life with Diabetes	26	9	35
DailyCarb Premium	21	9	30
DiabetesTeamLite	19	10	29
Wave Sense	19	10	29
Your Diabetes Diary	18	8	26
iFORA Diabetes Manager	16	6	22
Diabetes Pal by Telcare - Blood Glucose Manager	11	9	20
Glucose Buddy	12	7	19
LogFrog DB	14	5	19
myDiabetes	12	6	18
myMedtronic Connect	12	4	16
Glooko Logbook	10	4	14
Glucose Companion iPad free	7	6	13
Glucose Companion iPad	8	4	12
Onsync	7	5	12
Diabetes Management Database	7	4	11
iBGStar Diabetes Manager	8	3	11
Glucose	5	2	7
Glucose Manager Patient	3	3	6
Bolus Bridge	3	2	5
Diabetes Management Database Lite	5	1	5
Diabetes Management	3	1	4
Low GI Diet Tracker	3	1	4
Total available points	57	20	77
Mean	13.67	6.04	19.7
Standard Deviation	9.29	3.54	12.58

Strong Link Between Skills and Theory Scores

Overall app scores were low, with only one app earning more than half of available points



Discussion

Discussion

- Apps tended to be strong in self-monitoring blood glucose and risk-reduction
- Employment of theoretical constructs is relatively high across apps
- Every app employed at least one construct from the Social Cognitive Theory



Ratings show that none of the apps reviewed are comprehensive diabetes self-management tools

Discussion – Limitations

- Windows and Android phones not examined
- Just three behavioral theories assessed
- Survey instrument not validated by subject matter expert
- Second coder reviewed 18% of apps
- Review limited to apps available in September 2012



Conclusions & Recommendations

Conclusions & Recommendations

- No app replaces in-person diabetes self-management education
- Apps may act as a booster
- Apps needed which provide complete support across all skill areas
- More research needed on mobile apps for health

Questions?

Agilwz

Appendix: Sources

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