ARTICLES

CALORIE COUNTING APPLICATION FEEDBACK: POTENTIAL IMPACT ON THE TEENAGE FEMALE PSYCHE

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ABSTRACT:
From an early age, girls are surrounded by a desire to be thin. Because of this, eating disorders are a growing epidemic. Technology has been infused into the dietary world, enabling people to diet by themselves as long as Wi-Fi is present. Caloric input applications (apps that count calories) (CCA) have become the efficient way to monitor dietary choices. CCAs use feedback to alert users of proper caloric intake. It was hypothesized that if a diet that ranged between 800-1200 calories a day was entered into a CCA, then feedback generated would be more positive as compared to negative. During three weeks, the dietary choices of the principle investigator (P.I.) were entered into two CCAs. Three dietary profiles were used to simulate the eating habits of an adolescent female. Caloric intake was tracked three times a day and feedback was collected. A certified psychologist classified the feedback. It was determined that there was a relationship between calories entered into the app and the type of feedback generated. Future studies should focus on the development of a CCA that focuses more on when the user is eating rather than calories.

INTRODUCTION:
Women’s self-esteem and body image is, on average, lower than men’s. Women, both anorexic and non-anorexic, tend to improperly gauge their shape and body features. Improvement in body image and health related quality of life (HRQoL) closely relate to change in weight. The most common areas of the body to be viewed as disproportionate are the abdominal and femoral regions. Women who are too concerned with body image think they are inadequate in both a psychological and social aspect. There is a growing correlation between concern over weight gain and negative a body image that can lead to negative social relations.

Media has started targeting adolescents, causing an increase of cases in eating disorders in females from the ages of 12 to 25. By middle school, up to 70% of girls are dissatisfied with at least two body parts. 47% of adolescent girls say that fashion magazines give them a body image to strive for, and 60% compare their bodies to these models. 48% of girls desire the bodies’ of models showcased in magazines, and 31% of girls admit to starving themselves or refusing to eat as a technique to lose weight.
It was hypothesized that if a diet that ranged between 800-1200 calories for a teenage female was entered into a counting calorie application, then there would be a greater amount of positive feedback generated as compared to negative feedback. Eating disorders continue to plague today’s society at a rapidly increasing pace. Since the 1990s, the number of cases in the United States has risen 33%.1 This study tested if technology, specifically the counting calorie applications, puts adolescent girls at greater risk for changing their eating habits negatively. If the applications are causing health problems, specifically in female adolescents, this can give dietitians an idea on why eating disorders are growing rapidly in a society of seemingly healthy teenagers. A solution can be created to lower the number of cases of eating disorders.

MATERIALS AND METHODS:

Pre-study Methods:
The principle investigator (P.I.) downloaded the two most popularly used calorie-counting applications on the Apple App store (Myfitnesspal and Lose-It). Three profiles per app were generated to represent potential diets of a female teenage. The control profile consumed 1201-1400 calories a day. The variable one profile consumed 25% calories less than the control profile (that being between 800 and 1200 calories a day). The variable two profile consumed 25% more calories than the control group (that being 1401-1800 calories a day). While creating the profile, each profile’s user profile was for an 18-year-old girl weighing 150 pounds, wanting to lose 15 pounds.

Study period Methods:
For 21 days, the dietary choices of the P.I. were inputted into the control profiles in each app, and then proper calorie amounts were calculated for both variable profiles, and inputted into the app. Breakfast, lunch, dinner and snacks were tracked. The equation used to calculate the variable profile calorie amounts was the following:

\[ \text{Control calories (N) X.25=C} \]

\[ \text{N-C= Variable one profile calories} \]

\[ \text{N+C= Variable two profile calories} \]

Screen shots were taken every night after tracking as done for the night. On the 7th, 14th, and 21st day, screenshots of feedback were printed. At the end of the collection time, the P.I. met with a certified psychologist and the feedback generated by the apps were classified as positive, negative, or neutral.

Post-study Methods:
After feedback was classified, the P.I. created data tables and organized the amount of feedback collected on each day for each profile, in each app. A one-tailed T-test (p=.01) was run, comparing the feedback generated by the control group as compared to the two variable profiles.

Results:
Feedback was generated for both apps based on the calories, fat, carbohydrates, and protein inputted into the CCAs. Feedback was classified based off color. In figure three and four, two examples of feedback are shown. It was hypothesized for the variable one profile (consuming 800-1200 calories a day) that more positive feedback would be generated as compared to negative feedback. In the app Myfitnesspal (MFP), (figure one) feedback collected was deemed positive 95% of the time throughout the three-week trial. In the app Lose-It (LI), (figure two) feedback collected was deemed positive 71% of the time throughout the three-week trial. Calorie amounts that were entered into both apps were, on average, 300 calories under the allotted amount generated by MFP and 150 calories under the allotted amount generated by LI. There was a direct correlation between the number of calories consumed and feedback generated by both apps. As long as calories consumed did not surpass the allotted amount, feedback generated was positive.

It was hypothesized for the control profile (consuming 1201-1400 calories a day) that more negative feedback would be generated as compared to positive feedback. In MFP, (figure one) feedback was deemed negative 86% of the time throughout the three-week trial while feedback was deemed positive only 18% positive throughout the three-week trial. In LI, (figure two) feedback was deemed negative 100% of the time throughout the three-week trial. Calorie amount that were entered into both apps were, on average, 107 calories over the allotted amount generated by MFP and 257 calories over the allotted amount generated by LI. There was a direct correlation between
the number of calories consumed and feedback generated by both apps. When calories consumed surpassed the allotted amount, feedback generated was negative. For each day during the study for LI, the calorie amount consumed always surpassed the allotted amount, explaining why feedback was deemed 100% negative.

It was hypothesized for the variable two profile (consuming 1401-1800 calories a day) that more negative feedback would be generated as compared to positive feedback. In MFP, (figure one) feedback was deemed negative 71% of the time throughout the three-week trial while feedback was deemed positive only 24% positive throughout the three-week trial. In LI, (figure two) feedback was deemed negative 100% of the time throughout the three-week trial. Calorie amounts that were entered into both apps were, on average, 287 calories over the allotted amount generated by MFP and 437 calories over the allotted amount generated by LI. There was a direct correlation between the number of calories consumed and feedback generated by both apps. When calories consumed surpassed the allotted amount, feedback generated was negative. For each day during the study for LI, the calorie amount consumed always surpassed the allotted amount, explaining why feedback was deemed 100% negative.

Figure 1: Table of the percentage of feedback generated by the MFP app

<table>
<thead>
<tr>
<th>MFP feedback</th>
<th>Positive</th>
<th>Negative</th>
<th>Even</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>95%</td>
<td>0%</td>
<td>5%</td>
</tr>
<tr>
<td>C</td>
<td>14%</td>
<td>86%</td>
<td>0%</td>
</tr>
<tr>
<td>V2</td>
<td>24%</td>
<td>71%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Figure 3: Feedback collected from Lose-It from the Variable one profile.

<table>
<thead>
<tr>
<th>Lose-It feedback</th>
<th>Positive</th>
<th>Negative</th>
<th>Even</th>
</tr>
</thead>
<tbody>
<tr>
<td>V1</td>
<td>71%</td>
<td>19%</td>
<td>10%</td>
</tr>
<tr>
<td>C</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>V2</td>
<td>0%</td>
<td>100%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Figure 4: Feedback collected from MFP from the Variable one profile.

Table 1: Table of the percentage of feedback generated by the Lose-It app

Table 1: Table of number amount of positive feedback collected each day for each profile in Myfitnesspal.
Table 2: Table of number amount of negative feedback collected each day for each profile in Myfitnesspal.

Table 3: Table of number amount of positive feedback collected each day for each profile in Lose-It.

Table 4: Amount of negative feedback collected each day for each profile in Lose-It.

Figure 5: One tailed matched pairs T-test run on positive feedback collected from Myfitnesspal. X-axis=control feedback, Y-axis=variable profile feedback each profile in Lose-It.

Figure 6: One tailed matched pairs T-test run on negative feedback collected from Myfitnesspal. X-axis=control feedback, Y-axis=variable profile feedback.
Figure 7:
One tailed matched pairs T-test run on positive feedback collected from Lose-It. X-axis=control feedback, Y-axis=variable profile feedback.

Figure 8:
One tailed matched pairs T-test run on positive feedback collected from Lose-It. X-axis=control feedback, Y-axis=variable profile feedback.

Statistical Analysis:
Match paired T-tests (p=.01) were run to compare the control profile feedback and variable profile feedback. Tables 1-4 were used to run four tests. In figure five, the y-axis represents the positive feedback generated by the variable profiles in Myfitnesspal (MFP) and the X-axis represents the positive feedback generated by the control profile in MFP. Statistical significance was achieved when this test was run when |t|>.0001 (Figure five). In figure six, the y-axis represents the positive feedback generated by the variable profiles in Lose-It (LI) and the X-axis represents the positive feedback generated by the control profile in LI. Statistical significance was achieved when this test was run when |t|>.0001 (Figure six). In figure seven, the y-axis represents the negative feedback generated by the variable profiles in MFP and the X-axis represents the negative feedback generated by the control profile in MFP. Statistical significance was achieved when this test was run when |t|>.0001 (Figure 7). In figure eight, the y-axis represents the negative feedback generated by the variable profiles in LI and the X-axis represents the negative feedback generated by the control profile in LI. Statistical significance was achieved when this test was run when |t|>.0001 (Figure 8).

DISCUSSION:
From this study, it can be inferred to some extent feedback generated by calorie counting apps, specifically Myfitnesspal and Lose-It, on average produce more negative feedback than positive feedback. There was a direct correlation between calories inputted into the calorie counting apps and feedback generated, meaning that the more calories inputted into MFP or LI, then more negative feedback would be generated. The second and third traditional hypotheses are supported with the additional inference that increased calorie amount entered into the apps will result in more negative feedback being generated. Because of the direct correlation between the amount of calories inputted into both apps and the feedback the apps generated, for the most part, there is an unlikely chance that there would be an equal amount of positive and negative feedback. That being said, on two different days for MFP and LI, there was an equal amount of positive and negative feedback generated.

There was feedback that was generated by the fat, carbohydrates, and protein; however, types of fats and carbohydrates were not found to have a
considerable effect on the feedback generated. This is interesting because the apps create a stigma that all fat is negative, while in reality, fat is important for the body. It also does not stress the importance of carbohydrates even though they are the number one source of energy. The apps could lead users to consume a high lean protein, low carbohydrate diet, which could restrict calorie amount for the day. A balanced diet is the best way to sustain a healthy lifestyle, which users should be striving for.

The main question of this investigation (Is there a correlation between feedback generated by counting calorie applications and changes in eating behaviors in teenage girls?) cannot be rejected or accepted with confidence, because feedback was generated and classified only. Because this study was a self-study, not a human participant study, it is not possible to say if the feedback would cause a change in eating behaviors in adolescent females. However, with cases of eating disorders continuing to escalate, it is suggested that similar studies be conducted in a larger population to further investigate this topic. These results can be used to create long-term, more serious plans to create safer and more effective apps for weight loss, if results show this is necessary. It is suggested that further work be conducted on this topic extending the time of the study, different calorie counting apps, and increasing the number of participants, where participants track how the feedback generated effects their desire to eat and body image.

**ABBREVIATIONS:**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>CCA</td>
<td>CALORIE COUNTING APPLICATION</td>
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<tr>
<td>MFP</td>
<td>MYFITNESSPAL</td>
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<tr>
<td>LI</td>
<td>LOSE-IT</td>
</tr>
<tr>
<td>P.I.</td>
<td>PRINCIPLE INVESTIGATOR</td>
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<tr>
<td>APPS</td>
<td>APPLICATIONS</td>
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**Key Word:** calorie; application; eating behavior; body image; dieting, feedback.

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**REFERENCES:**

