Psychosocial predictors of intentions to comply with bariatric surgery guidelines

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An increasing body of research suggests that many patients have difficulty adopting the eating guidelines after weight-loss surgery, thereby reducing the long-term success of the procedure. Given such difficulties, it is possible that the typical preoperative education regarding post-surgical eating behavior guidelines is ineffective in motivating some individuals to comply. Presently, no accurate predictors of intentions to comply with post-bariatric surgery guidelines have been identified. In the present pilot study, a psychosocial intervention based on protection motivation theory (PMT) was presented to patients undergoing bariatric surgery. PMT is a well-established preventive health model that has been utilized in a variety of health domains. Participants for this study were recruited before undergoing bariatric surgery, and were randomly assigned to one of two groups: PMT group vs. control. In addition to routine messages from the bariatric surgeon, participants in the PMT group received an intervention based in PMT that focused on the importance of adhering to post-surgical eating behavior guidelines and how best to adhere to these guidelines. Participants in the control group received standard of care information from the bariatric surgeon. Results indicated that the PMT intervention did not have a significant impact. However, follow-up analyses revealed that two aspects of PMT, perceived self-efficacy and perceived threat of not following the guidelines, predicted patients' intentions to comply with post-surgical guidelines. Findings are discussed in terms of the methodological compromises that resulted from the applied research setting as well as promising avenues for future investigation.

Keywords: protection motivation theory; health behavior model; post-surgical compliance; bariatric surgery outcome

Introduction

Obesity is now an epidemic in the United States. According to recent health surveys, over 1/3 of American adults are considered obese (Ogden, Carroll, McDowell, & Flegal, 2007). Over the last 20 years, the number of obese Americans has increased by more than 30% (Mehler, Lasater, & Padilla, 2003), with the most rapid increase seen in those considered extremely obese. Obesity is linked to a number of medical
Obesity is defined in terms of body mass index (BMI), calculated as weight in kilograms divided by the square of height in meters. BMI is a reliable measure of body fat because it is highly correlated with fat mass and minimally with height (Mehler et al., 2003). For the extremely obese, there is considerable evidence that traditional nonsurgical obesity treatments, such as diet, exercise, and pharmacotherapy, are ineffective for achieving long term, significant weight loss (Buchwald et al., 2004). Due to the failure of such noninvasive treatments and excessive costs related to treatment of obesity-related medical comorbidities, increasing numbers of obese individuals are pursuing weight loss surgery ('bariatric' surgery) which modifies the stomach and/or intestines to reduce the amount of food that can be eaten and absorbed.

The number of bariatric surgeries performed in the United States increased by over 10-fold between 1992 and 2005 (Colwell, 2005). The most widely performed procedure (Mehler et al., 2003), Roux-en-Y gastric bypass (RYGBP) surgery, is considered by some to be the gold standard of surgical treatments for extreme obesity (Griffen, 1992). RYGBP is a combination of restrictive (limiting food intake) and malabsorptive (i.e. altering the way nutrients are absorbed) surgeries.

Approximately 90% of patients who undergo RYGBP surgery can expect to lose 30–50% of their body weight after surgery (Mun, Blackburn, & Matthews, 2001), although sustained weight loss requires adherence to strict post-surgical guidelines. There is growing evidence that some patients struggle to adhere to the post-operative eating behavior guidelines (Anderson & Larsen, 1989; MacLean, Rhode, & Shizgal, 1983; Sarwer et al., 2008) and patients often revert back to pre-surgical eating habits. Overeating after RYGBP surgery may occur as patients learn how to circumvent the surgical and dietary restrictions by either consuming large amounts of soft foods or calorie-dense liquids, or by continually grazing on small amounts of high caloric foods (Hsu, Bentancourt, & Sullivan, 1996; Hsu et al., 1998). Such eating habits can reduce or even reverse post-surgical weight loss (Halverson & Koehler, 1981; Hsu, Sullivan, & Benotti, 1997; Kalarchian et al., 2002; Rabner & Greenstein, 1991; Sarwer et al., 2008).

**Protection motivation theory**

Traditionally, education has been the primary method used to encourage preventive health behaviors. Although such an approach increases knowledge, it usually produces little change in behavior (Prentice-Dunn, McMath, & Cramer, 2009). More promising results have been shown by interventions that seek to not only educate, but also motivate people to act (McMath & Prentice-Dunn, 2005).

Protection motivation theory (PMT) (Prentice-Dunn & Rogers, 1986; Rogers & Prentice-Dunn, 1997) is a well-researched psychosocial model that explains how cognitive processes lead to healthy behavioral changes. This model specifies the components of a health-promotion message that increase compliance with a health behavior. These message components are included in two appraisal processes that occur when one receives health information: threat appraisal and coping appraisal. PMT holds that to change a maladaptive behavior, individuals must first detect a
substantial threat to their health and then be provided with an effective way to avert the threat. This is accomplished through suggestions on how to substitute an adaptive, healthy behavior for the maladaptive one.

In this study, threat appraisal was linked to poor eating behavior compliance after bariatric surgery. Affecting one’s threat appraisal are the perceived severity of the threat (e.g. adverse consequences of not following eating behavior guidelines) and how vulnerable one feels to the threat.

The coping appraisal process is linked to the suggested adaptive response of adhering to post-surgery guidelines. Coping appraisal involves the variables of response efficacy and self-efficacy. Response efficacy is the perception that adhering to the guidelines will enable one to avoid negative health consequences, whereas one’s perceived ability to follow the guidelines is called self-efficacy.

The present study

The long-term success of bariatric surgery is contingent upon patients’ strict adherence to the post-surgical guidelines (Pontiroli et al., 2007). However, it is not yet documented whether the information provided to patients is successful in motivating them to comply with the post-surgical guidelines and no robust predictors of post-surgery success have been identified. This pilot study sought to utilize a theory-based, systematically presented message to patients undergoing bariatric surgery to determine what factors increase intentions to comply with eating behavior recommendations after surgery.

Method

Participants

Participants were 82 adults between the ages of 21 and 56 who were seeking RYGBP surgery at a major medical center in the southeastern United States. All participants met criteria for bariatric surgery (i.e. BMI ≥ 40 or BMI ≥ 35 with medical comorbidities). This criterion was set to ensure a more homogeneous group of participants in terms of motivations for surgery, expected weight loss, and health behavior compliance after surgery.

Measures and materials

PMT manipulation checks

Participants completed a 32-item questionnaire that contained manipulation check items for the primary PMT variables (severity of threat, vulnerability, response efficacy, and self-efficacy) during the study session and 1 week later. Each PMT variable was represented by a sum of eight items, each rated on a 14-point Likert scale. These items were similar in structure and content to items used in prior PMT studies (Fry & Prentice-Dunn, 2005; 2006; McMath & Prentice-Dunn, 2005; Prentice-Dunn et al., 2009).

Intentions to comply

The impact of the intervention was assessed by a behavioral intentions questionnaire that contained 11 items assessing participants’ intentions to comply with eating
behavior guidelines post-surgically. Similar behavioral intentions items have been used successfully in prior studies (Fry & Prentice-Dunn, 2006; Prentice-Dunn et al., 2009). Examples of questionnaire items are provided in Table 1.

Table 1. Sample items from the questionnaires completed at the study session and the 1-week booster mailing.

<table>
<thead>
<tr>
<th>PMT questionnaire:</th>
<th></th>
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<tbody>
<tr>
<td>Overeating after surgery can slow someone's weight loss.</td>
<td>Sev</td>
</tr>
<tr>
<td>Eating restricted foods after surgery can lead to complications like diarrhea,</td>
<td>Sev</td>
</tr>
<tr>
<td>headaches, and nausea.</td>
<td></td>
</tr>
<tr>
<td>People are not affected much if they eat more than they should after surgery.*</td>
<td>Sev</td>
</tr>
<tr>
<td>If I cheat after surgery and start to reintroduce unhealthy foods back into my</td>
<td>Vul</td>
</tr>
<tr>
<td>diet, I may regain weight</td>
<td></td>
</tr>
<tr>
<td>I can suffer health problems if I overeat after surgery.</td>
<td>Vul</td>
</tr>
<tr>
<td>When people don’t overeat after surgery, the chances of permanent weight loss are high.</td>
<td>RE</td>
</tr>
<tr>
<td>Following suggested eating guidelines improves the chances of losing weight.</td>
<td>RE</td>
</tr>
<tr>
<td>I believe that I can successfully avoid overeating after surgery.</td>
<td>SE</td>
</tr>
<tr>
<td>It is overwhelming to me to think about the dietary changes I will have to make after surgery; I don’t think I can do it.*</td>
<td>SE</td>
</tr>
</tbody>
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Behavioral intentions questionnaire:
Following surgery, I plan to closely follow the recommended eating behavior guidelines.
After surgery, I plan on limiting my portion sizes so that I don’t overeat.
I plan on continuing to eat whatever I like after surgery.*

*Denotes an item that is reverse scored.
Sev, severity; Vul, vulnerability; RE, response efficacy; SE, self-efficacy.

Procedure
Potential participants were contacted via telephone prior to their initial evaluation with the bariatric surgeon. They were told that their participation in the study would in no way affect their medical care or surgical approval. Interested patients were told to arrive one hour before their scheduled evaluation to attend the study session. Participants were randomly assigned to one of two groups: PMT group (those receiving the PMT-based intervention) and the control group.

Questionnaire data were collected at two time points: (1) in a small group format prior to routine pre-surgical evaluations for patients interested in pursuing RYGBP surgery and (2) from mailings to participants one week later.

PMT intervention condition
Participants in the intervention condition received PMT information during an initial group session and in the form of mailed materials one week later (one-week booster). In the study session, participants followed an eight-page essay (8th grade reading level) containing information about eating behavior guidelines after weight loss surgery that was read aloud by the study’s principal investigator (AGB). The essay presented threatening information about the effects of not complying with eating behavior guidelines post-surgery (e.g. unpleasant physical symptoms, weight
gain). The essay also stressed the effectiveness of adaptive behaviors that patients can engage in to combat these effects, such as never eating more than the stomach pouch can hold and planning meals in advance. Finally, the essay emphasized that all patients are capable of performing the recommended behaviors to avoid complications. A group discussion of the essay was then held to ensure that all participants understood the information presented. Any questions were addressed at this time.

Participants were then presented with written information from two post-surgical patients. This information was contained in written material detailing these patients’ struggles to follow post-surgical eating guidelines and their ultimate success with weight loss. The investigator guided participants through the readings in order to highlight important points.

The investigator then gave an overview of the session. Participants were reminded of the following important points from the session: (a) failure to follow the post-surgical guidelines can cause weight re-gain and consequences to their health; (b) each patient is vulnerable to these consequences; (c) there are many things that patients can do to prevent consequences; and (d) these recommendations can be incorporated into every lifestyle. Patients then completed the PMT-based questionnaire and the behavioral intentions questionnaire.

One-week booster
Approximately one week after completion of the study session, participants were mailed a packet to their home address containing the PMT-based questionnaire, the behavioral intentions questionnaire, and a three-page summary of the information presented during the group session containing the threat and coping components. The summary focused on the deleterious effects of poor-eating behavior compliance after bariatric surgery and adaptive behaviors that patients can engage in to combat these effects. Response efficacy and self-efficacy were particularly emphasized. Participants were asked to read the information provided and return the completed questionnaires to the study’s investigator via a provided pre-paid mailing envelope.

Control condition
Individuals in the control group also attended the study session in a small group format and received follow-up questionnaires via mail. However, control participants did not receive any information on the post-surgical eating behavior guidelines from the investigator. Rather, these individuals received standard information from the bariatric surgeon and his staff which is provided to all pre-surgical patients, including information on appropriate post-surgical eating guidelines, such as eliminating sugar, eating slowly, and eating adequate protein. The surgeon and his staff were blind to group status (and whether or not patients had participated in the study) and being in this study did not affect any information given to patients from the surgeon. This information was based on the surgeon’s personal approach to presenting the guidelines and was impossible to control in this study.

Control participants also received the PMT questionnaire and the behavioral intentions questionnaire in the mail at the one-week follow-up point and were asked to complete these and return to the study’s investigator.
Results

Participant characteristics

The PMT group \((n = 44)\) consisted of 15 males and 29 females and the control group \((n = 38)\) contained 14 males and 24 females. Both groups had completed an average of 14 years of education and the majority of participants in both groups identified as Caucasian. The average BMI of patients in the PMT group was 51.8 kg/m\(^2\) and that of the control group was 50.1 kg/m\(^2\). There were no significant differences between the two groups on any demographic variables (see Table 2).

<table>
<thead>
<tr>
<th></th>
<th>PMT group</th>
<th>Control group</th>
<th>Total sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>(n = 15) (34%)</td>
<td>(n = 14) (37%)</td>
<td>(n = 29) (35%)</td>
</tr>
<tr>
<td>Female</td>
<td>(n = 29) (66%)</td>
<td>(n = 24) (63%)</td>
<td>(n = 53) (65%)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td>41.3 (7.8)</td>
<td>41.7 (9.2)</td>
<td>41.5 (8.4)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasians</td>
<td>(n = 33) (77%)</td>
<td>(n = 24) (63%)</td>
<td>(n = 27) (70%)</td>
</tr>
<tr>
<td>African-Americans</td>
<td>(n = 11) (23%)</td>
<td>(n = 14) (37%)</td>
<td>(n = 25) (30%)</td>
</tr>
<tr>
<td><strong>Years of education</strong></td>
<td>13.9 (2.3)</td>
<td>13.4 (2.7)</td>
<td>13.7 (2.5)</td>
</tr>
<tr>
<td><strong>Body mass index (kg/m(^2))</strong></td>
<td>51.8 (13.0)</td>
<td>50.1 (8.5)</td>
<td>51.0 (10.9)</td>
</tr>
</tbody>
</table>

Psychometric properties

Coefficient alphas were used to determine the consistency of the scale items making up the primary PMT appraisal processes manipulated in the intervention: threat appraisal and coping appraisal. Before calculating the coefficient alphas, three items were deleted based on low item-total correlations. Threat appraisal \((\alpha = 0.62)\) was calculated by summing the severity and vulnerability items. Coping appraisal \((\alpha = 0.65)\) was comprised of a sum of the items assessing response efficacy and self-efficacy. For behavioral intentions, the \(\alpha\) was 0.66. The alphas obtained are consistent with those of prior studies in which PMT variables were manipulated successfully (McClendon & Prentice-Dunn, 2001; Milne, Sheeran, & Orbell, 2000; Prentice-Dunn & Rogers, 1986).

Manipulation checks

For the threat appraisal sum, a 2 (group: PMT vs. control) × 2 (Time: study session vs. 1-week booster) ANOVA found no main effects for group \((F (1, 50) = 3.85, p = 0.06)\) or time \((F (1, 50) = 2.38, p = 0.13)\). No significant interaction effects occurred \((F (1, 50) = 0.41, p = 0.53)\).

For the coping appraisal sum, there was no significant main effect of group \((F (1, 50) = 0.07, p = 0.79)\); however, there was a main effect for time \((F (1, 50) = 14.59, p < 0.01)\). In general, participants scored higher on the coping appraisal sum at the 1-week booster than at the study session. No significant group × time interaction was found \((F (1, 50) = 0.10, p = 0.75)\).
Dependent measures

Given the nonsignificant impact of the intervention, the groups were collapsed to one sample \( n = 82 \) and a general linear modeling procedure was used to determine the relation between the PMT variables and the dependent variable of intentions to comply with recommendations. Results indicated that the overall regression equation was significant \( F(3, 81) = 13.42, p < 0.01; R^2 = 0.43 \). Significant partial regression coefficients were found for self-efficacy \( (\beta = 0.25, p = 0.01) \) and for threat \( (\beta = 0.30, p = 0.03) \). Thus, higher levels of self-efficacy and higher levels of threat predicted greater intentions to comply with post-surgical recommendations.

Discussion

The primary objective of this study was to determine whether a systematically presented message based in PMT would increase patient intentions to comply with post-surgical eating behavior guidelines in candidates for RYGBP, and if so, which aspects of the message were most important. Contrary to expectations, the PMT intervention was not found to have a significant impact on participants’ threat and coping appraisal processes.

Although no significant group differences were found, the self-efficacy and perceived threat factors were important predictors of the primary outcome variable of intentions to comply with post-surgical guidelines. Intentions to engage in a behavior are typically assumed to be an accurate predictor of actual behavior in most motivational models (Godin & Kok, 1996) and research has demonstrated that intentions to perform a behavior typically translate into actual behavior in PMT studies (Floyd, Prentice-Dunn, & Rogers, 2000). These findings are consistent with results from a myriad of health domains that perceived threat energizes individuals to act to protect themselves and that the perceived ability to follow recommendations is important in following through on recommendations (Floyd et al., 2000; Milne et al., 2000). Prior researchers (Fry & Prentice-Dunn, 2006; Prentice-Dunn et al., 2009) have found that coping appraisal information such as self-efficacy is crucial to channel threatened individuals away from maladaptive reactions such as fatalistic thinking and avoidance and toward such adaptive reactions as increased intentions and behavior change. Thus, our findings suggest that adding PMT components to the preoperative education may be useful for professionals who are preparing patients for the dietary and behavioral changes required by surgery.

Limitations

Although our post-hoc analyses point to the potential value of a PMT intervention, the applied setting of the study presented many factors beyond our control that likely affected our ability to demonstrate the effectiveness of the intervention. First, while it was important to have a strong threat presented to patients, the danger could not be so threatening as to deter patients from having surgery. Additionally, all participants in this study were receiving standard information on the post-surgical guidelines from the bariatric surgery team as they were being evaluated for surgery. It became apparent over the course of this study that this information had been modified, as the surgeon’s preoperative education increasingly addressed consequences of not following the eating behavior guidelines. This new information
may have produced some overlap between what was presented in the intervention and what all patients (regardless of what group they were in) were told by the surgeon. It is also possible that the intervention session and the one-week follow up information were too brief to make an impact on participants’ attitudes. In fact, several PMT-based studies that have demonstrated stronger effects have typically involved a more lengthy intervention (e.g. McClendon & Prentice-Dunn, 2001; McMath & Prentice-Dunn, 2005; Prentice-Dunn, McMath, & Cramer, 2009).

Conveying a sense of vulnerability to the unpleasant effects of post-surgical non-adherence was also challenging. For some patients, it may be difficult to fathom the possibility of having post-surgical difficulties (i.e. physical complications, weight re-gain). Many patients who undergo bariatric surgery do not anticipate the recurrence of poor eating habits post-surgically and tend to overestimate the effectiveness of the surgery (Rabner & Greenstein, 1991). Thus, they may not see themselves as vulnerable to poor post-surgical outcome and may not intend to follow the guidelines as strictly as directed.

Conclusion and future directions

There is no denying the effectiveness of bariatric surgery’s ability to produce substantial, short-term weight loss in obese and extremely obese individuals. However, in some patients, post-surgical success is less than optimal, and is possibly related to poor adherence to the recommended post-surgical eating guidelines (Pontiroli et al., 2007; Sarwer et al., 2008).

This pilot study represents the first attempt to apply PMT to increase compliance with post-surgical eating behavior guidelines in bariatric surgery candidates. Although the intervention did not produce significant group differences, the PMT components of self-efficacy and threat proved to be useful in predicting patients’ intentions to adhere to the post-surgical eating behavior guidelines. These preliminary results imply that bariatric surgery teams should strive to ensure that patients adequately understand the consequences of not following recommendations and that the teams adequately bolster patients’ confidence in their ability to adhere to the guidelines. These results also suggest that it might be fruitful for surgery teams to spend adequate time educating patients about appropriate post-surgical guidelines. Although it cannot be determined from this study whether participants’ intended compliance will translate into complete adoption of post-surgical guidelines, it appears that patients’ perception of the consequences of not following recommendations and their confidence in their ability to incorporate post-surgical eating behavior changes are significant factors in their intention to do so.

Although surgical treatment of obesity is on the rise, much remains unknown about the specific factors that promote patient adherence to the post-surgical guidelines and subsequent adoption of healthier habits. For this reason, it is imperative that investigations continue to determine factors that affect post-surgical outcome. Such information will serve to increase the effectiveness of bariatric surgery at producing clinically significant, sustained weight loss, thereby potentially reducing the impact of the obesity epidemic.

References


