Research Article

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The Relationship of Pre-Operative Stress Level to Sustained Outcome in Gastric Bypass Surgery

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Abstract

Purpose: Previous research has shown that pre-operative health status can serve as a moderator in enhancing the accuracy of certain variables for predicting sustained weight loss after gastric bypass surgery. The present study investigated the role of pre-operative stress level as a moderator in identifying useful pre-operative predictors of sustained weight loss.

Materials and Methods: Follow-up data at a mean of 3.2 years post-operatively were available for 111 patients who had undergone pre-operative assessment on 227 variables including four psychological assessment instruments. These measures were studied for their success in predicting sustained weight loss separately for patients who were under low and high pre-operative stress.

Results: As anticipated, several types of variables (support, coping skills, good adjustment, and good cognitive functioning) predicted success for both groups. In addition, for low-stress patients, social drinking and self-efficacy variables (strong expectations of a broad range of positive changes), and a broader range of personal support variables were the best predictors. For high-stress patients, the best predictors included the presence of a troubled intimate relationship, lack of attention to personal health matters, an active history of smoking, and the possible need for psychiatric medication. Overall, the results show some consistency with the basic postulates of self-determination theory.

Conclusion: The findings provide further support for the view that the investigation of pre-intervention variables can provide useful information in enhancing the predictive accuracy of the success of major life interventions in medical and other settings.

Keywords: Gastric bypass surgery; Weight loss; Pre-operative health

Introduction

It has been stated that the area of greatest concern in gastric bypass surgery (GBS) is not the achievement of an initial weight loss, but sustaining this loss and continuing to lose weight over time [1]. This statement is consistent with the authors' own work, in which, after a mean weight loss of 45.61 kg (16.42 BMI) after the first post-operative year (0-1 year), the mean change over the subsequent two years (1-3 year) was essentially zero (0.28 kg; 0.15 BMI) [2]. The authors also found that the best pre-operative predictors of the 1-3 year weight loss were mostly different from the predictors of the 0-1 year weight loss as reported by Lanyon and Maxwell [3].

Because the major predictor of the 0-1 year change but not a predictor of the 1-3 year change was good pre-operative health, it was hypothesized that the predictors of 1-3 year change for patients in good physical health prior to surgery would be different from those whose pre-operative health was poor. These hypotheses were borne out [4].

However, more relevant for practical utility would be pre-operative predictors of weight loss over the entire period (0-3 years). These

predictors were also different for good and poor pre-operative health patients, and tended to mirror the 1-3 year loss comparisons. For good pre-operative health patients, they centered around variables related to psychological distress and poor self-concept, but strong coping skills and strong expectations of major life improvements as a result of the surgery. For poor pre-operative health patients, the predictors of success were quite different. They involved strong personal support, life satisfaction, and good psychological adjustment and happiness, but little health-related knowledge. Overall, they characterized persons who had strong dependency needs that were being fully met by others. A possible explanation for these findings is that extreme support and good psychological adjustment are necessary in order for persons burdened by poor health to successfully take on this additional life task.

These findings show that pre-operative health serves as a moderator for number of predictors of sustained success in GBS, thus providing a means of improving the accuracy of predicting outcome, and assisting in the decision as to whether to utilize GBS as an approach to obesity for any particular patient. The findings raise the possibility that other pre-operative characteristics could also be found to serve a similar function, thereby improving predictive accuracy even further.

Aims of the Present Study

Another pre-operative variable that could logically be considered to impact GBS patients in their efforts at continued weight loss is stress level. It can be readily seen that in addition to impairments and incapacities due to medical difficulties, there can also be impairments and incapacities due to stresses that are not medical in nature. Such stresses could be logically expected to interfere with the sustained efforts that are needed to maintain weight loss after GBS. Nevertheless, many patients with high pre-operative stress do continue to lose weight. It was therefore hypothesized that, as with the pre-operative health variable, the pre-operative predictors of sustained outcome (0-3 year) would differ between persons with low pre-operative stress and those with high pre-operative stress. Thus, as with pre-operative health level, it was hypothesized that pre-operative life stress level would serve as a moderator in predictor-outcome relationships.

Methods

Participants

As described in previous work [4,5], participants were a subset of 243 patients who had undergone GBS at a large medical center in metropolitan Phoenix. The pre-operative evaluations were conducted by the second author, utilizing an extensive and comprehensive protocol. It included 273 interview items over 21 content areas covering biographical and medical history, plus four psychological inventories: the Minnesota Multiphasic Personality Inventory-2 (MMPI-2) [5]; the Basic Personality Inventory (BPI) [6]; the two sections of the Multidimensional Health Profile (MHP) [7], and a structured questionnaire reflecting the DSM-IV research criteria for binge-eating disorder [8]. As with the earlier studies, interview items involving specific details of medical history and parental histories were not considered relevant for the present study. Thus, a total of 227 items were considered as potential predictors, including test scores. Because the MHP scales and items had been selected to comprehensively cover the most important psychological aspects of health status, the individual items of the MHP were also considered as predictors.

In an earlier study, the authors demonstrated that simple weight change and simple change in BMI were the two most representative metrics for quantifying weight loss [7]. These measures were therefore used in the present study. Of the 243 patients who were assessed in this manner and underwent gastric bypass surgery, complete pre-operative data and 3-year follow-up data were available for 111. Contact had been maintained with as many patients as possible, through group support meetings. The 3-year follow-up was conducted by questionnaire, and for those who did not return the questionnaire, weight loss data were sought through telephone interviews.

To check for possible biases due to the fact that 3-year data were available on fewer than half of the GBS patients, the patients who did and did not provide these data were compared on relevant variables [2]. The differences between the two groups were that the follow-up group was older and better educated, and had lower pre-operative weight. However, there were no differences on the general medical and psychosocial variables that had earlier been found to be related to weight loss. It was therefore concluded that the weight-loss comparisons were not biased due to attrition.

Assessment of pre-operative stress

A composite measure was constructed to assess pre-operative stress level, involving a combination of three variables related to stress as reported on the MHP. The first variable, number of stressful events, involved the total number from a standardized list of stressful events over the previous year that had been endorsed by the patient.

Examples include "trouble with your boss or co-workers", "bought a new home", and "financial problems". The second variable, global stress, involved an overall rating on a 5-point scale of perceived stress or strain over the past year. The third variable, perceived stress was defined as the sum of the rated stressfulness of 17 possible stress-inducing events over the past year (e.g., "fired or laid off from your job").

A principal components analysis was conducted on these variables for all applicants for GBS who had completed the initial evaluation (N=425). This analysis yielded a single factor, with factor loadings of the three variables ranging from 0.85 to 0.92, demonstrating clearly that the three variables represented a single construct. The factor score was therefore utilized as the measure of stress.

High-stress and low-stress groups were defined as follows. The distribution of the 111 patients with complete follow-up data was dichotomized at the median, generating a low-stress group (N=55) and a high-stress group (N=56). Correlations were then computed separately for each group between the predictor variables as indicated above and the two measures of weight loss: simple weight loss and change in BMI. These groups are henceforth referred to as low-stress and high-stress respectively.

Results

Comparison of low and high pre-operative stress patients

The first calculations were a comparison of 0-3 year weight loss by the low-stress group and the high-stress group. The mean simple weight losses were 46.18 kg (SD 14.37) and 48.04 kg (SD 22.01) respectively. For BMI change, the figures were 15.39 (SD 5.29) and 16.91 (SD 7.59) respectively. As can be seen, the changes were very similar for the two groups. Thus, the study of differences in the predictors of weight loss between the two groups was not complicated by overall differences between them.

The next step was to identify pre-operative variables that were significantly correlated with 0-3 year weight loss and/or 0-3 year BMI change for both the low-stress patients and the high-stress patients. These results are shown in Table 1.

The variables fall into three general groups. First, there are variables related to receiving personal support at a satisfactory level when sick, both informational support and general support. Second are general coping skills. The third group includes two measures of positive personal functioning: lack of depression, and lack of cognitive difficulties. These are the pre-operative variables that are predictive of sustained (0-3 year) weight loss regardless of pre-operative stress level.

Predictor	Correlation[a]			
	Low Stress		High Stress	
	Weight	BMI	Weight	BMI
Receives informational support	0.31	0.36	0.27	0.29
Receives help from friends when sick	0.26	0.15	0.26	0.28
Total coping	0.26	0.23	0.31	0.34
Receives informational support from family and friends	0.27	0.36	0.31	0.28
Depressive affect	-0.28	-0.18	-0.28	-0.31
Cognitive disturbance	-0.37	-0.17	-0.37	-0.39
[a]At least one low-stress and one high-stress correlation is significant at $p < 0.05$				

Table 1: Significant predictors of 0-3 year weight loss for both pre-operative low-stress and pre-operative high-stress patients.

The major reason for conducting the present study was to find ways of improving the prediction of the outcome of GBS, based on the general hypothesis that success for different subsets of patients is better predicted by different pre-operative variables. Thus, the next step was to identify pre-operative variables that were predictive for one group (low-stress or high-stress patients) but not the other. These data are presented in Tables 2 and 3.

Predictor	Weight Change	BMI Change
Has stopped drinking	-0.32[b]	-0.29[b]
Drinks alcohol	0.44[b]	0.38[b]
Social drinking only	0.21	0.27
Expects better overall ability to work	0.37	0.35
Expects greater ease of work-related travel	0.26	0.27
Made specific plans to solve problems	0.35	0.30
Expects improved presentation to groups	0.31	0.28
Expects improved range of movement	0.28	0.29
Expects improved body mechanics	0.26	0.25
Expects improved ergonomics	0.28	0.25
Number of years married	-0.27	-0.23
Number of years in significant relationship	-0.29	-0.21
Expects greater self-esteem	0.31	0.34
Expects social life will improve	0.26	0.27
Expects more confidence	0.24	0.25
Main goal is to feel better	0.33	0.33
Has told friends of plans	0.32	0.30
Tells friends when sick	0.26	0.24
Receives help from family/friends when sick	0.26	0.28
Satisfied with help from family/friends	0.34	0.37
[a]One or both correlations are significant at $p < 0.05$; [b]Correlation is significantly different at $p < 0.05$ from the corresponding pre-operative high-stress correlation.		

Table 2: Additional predictors of 0-3 year weight loss for 55 pre-operative low-stress patients[a].

Predictor	Weight Change	BMI Change
Separated but not divorced	0.58[b]	0.55[b]
Significant relationship troubled	0.42[b]	0.37[b]
Number of years smoker	0.33[b]	0.33[b]
History of active smoking	0.48[b]	0.48[b]
Number of packs per day	0.26	0.30
Seeks spiritual help when sick	0.37[b]	0.38
Talks with minister when sick	0.28	0.27
Shy as adolescent	0.38[b]	0.37
History of juvenile arrest	0.42[b]	0.34[b]
Drives faster than speed limit	0.31	0.27
Advised to see psychiatrist for medication	0.29	0.27
Aware of bodily sensations	-0.27	-0.26
Pays attention to workings of body	-0.31	-0.26
Knows enough to protect against future illness	-0.26	-0.28[b]
Sum of prescription medications	-0.36[b]	-0.33
Health values	-0.27	-0.26
Score on MMPI-2 Hypochondriasis scale	0.24	0.29
Worries about health despite reassurance	0.22	0.29
[a]One or both correlations are significant at $p < 0.05$; [b]Correlation is significantly different at $p < 0.05$ from the corresponding pre-operative low-stress correlation.		

Table 3: Additional predictors of 0-3 year weight loss for 56 pre-operative high-stress patients[a].

Table 2 presents data for the low-stress patients. It shows the pre-operative variables (in addition to those in Table 1) that were found to be significantly predictive of 0-3 year weight change (p<0.05 for simple weight change or BMI change or both). It also identifies those variables that were significantly more predictive for the low-stress group than the high-stress group (one or both weight loss comparisons significant at p<0.05).

As shown in Table 2, predictors that were both significant for low-stress patients and significantly stronger than for high-stress patients were confined to variables related to alcohol use. Success for low-stress patients was correlated with active and continued alcohol use, with a trend suggesting that this refers to social drinking. Other variables that were significant for low-stress patients fall into several topic groups. The main group involves strong and comprehensive expectations of improvement-in work-related abilities, physical movement in general, and in social life, confidence, self-esteem; and feeling better overall. Also listed are a broad range of variables representing the amount of, and satisfaction with, personal support from family and friends; and a shorter rather than longer current marriage or significant relationship.

Table 3 presents analogous data for high-stress patients, showing the pre-operative variables that were found to be significantly predictive of 0-3 year weight change (p<0.05 for simple weight change or BMI change or both), and identifying those variables that were significantly more predictive for the high-stress group than the low-stress group (one or both weight loss comparisons significant at p<0.05). These results show that approximately the same number of variables were predictive of sustained weight loss as for low-stress patients. However, more were unique to the high-stress group than to the low-stress group. The major content areas include the presence of a troubled intimate relationship, a lengthy history as an active smoker, difficulties as an adolescent (shyness, arrests), a broad lack of interest in or attention to physical health (while nevertheless worrying about it), the use of spiritual counseling, and the possible need for psychiatric medication.

Discussion

The general hypothesis of the present study was that pre-operative predictors of sustained success (over three years) for GBS patients would differ according to pre-operative stress level. This hypothesis followed from the previous findings of major differences in outcome predictors between patients with good and poor pre-operative medical health status.

The present results showed several predictors of success in common for both low-stress and high-stress patients: good support from family and friends, good personal coping skills, and good psychological and cognitive functioning.

However, the groups differed as follows. The major characteristic of the successful low-stress patients was their strong and broad expectations for major life improvements-spanning work-related, social, physical, and general confidence and life-satisfaction areas. In addition, these patients had been in their major relationship for only a relatively brief period of time, and the overall number and range of

personal support variables was even stronger than for high-stress patients. For the high-stress patients, the strongest predictor was the presence of a troubled relationship including separation, a lack of interest and/or knowledge regarding health matters (in general and also regarding their own health status), and some possible adjustment difficulties during adolescence.

It is instructive to compare these results with those of the previous study, in which the outcome predictors for good pre-operative health and poor pre-operative health patients were studied. Similar to present study, the strongest predictors for the good-health patients involved strong and broad expectations for massive life improvements. But interestingly, these patients had relatively poorer psychological adjustment and poor self-concept. And analogous to the present findings, a strong predictor for the poor pre-operative health patients was poor knowledge and little interest in matters involving health information in general and also in their own health. But the poor-health patients who improved the most had massive personal support and were happy and well-adjusted-essentially, they were happy people who were being were fully and completely taken care of.

In viewing the present results, it is logical to view high pre-operative stress as potentially interfering with progress (continued weight loss), noting that the low-stress patients did not have such interference. The task confronting the low-stress patients was a more straightforward one. It is no surprise that success for both groups was related to the variables that predict success in any therapeutic endeavor: good coping skills, good personal support, and good personal adjustment. But a major predictor for low-stress patients was a strong expectation of success across many life areas. This characteristic, termed self-efficacy by Bandura [9], has been repeatedly shown to be a strong predictor of successful therapeutic change.

What of the patients with high pre-operative stress? The results suggest that many of them had serious relationship problems-perhaps the cause of the high stress; and it can be speculated that a desire for a better relationship might have been a driving force for successful sustained weight loss. Their lack of interest in health matters suggests that their approach to change was idiosyncratic or autonomous, rather than following specific instructions on what they were "supposed" to do.

The pattern of findings in both the present and the previous study show some degree of correspondence with predictions that could be made from self-determination theory as applied to health contexts [10]. A basic tenet of this theory is that "behavior change is more effective and lasting when patients are autonomously motivated" (p. 325). Also included is the importance of three basic psychological needs to "motivate the initiation and long-term maintenance of health behaviors" (p. 326): autonomy, competence, and relatedness. Such themes can be seen in the variables related to success in the present authors' work. It is particularly noted that for patients with extra burdens (poor health; high stress), the successful patients were those who ignored the "rules"-the conventional health-related knowledge-and simply did it their own autonomous way. And for the good-health and low-stress patients, the motivation for successful change appears to have been intrinsic-the personal drive to have a better life, rather than based on external factors.

A word should be said about two unexpected variables that were found to be related to success in the present study: significant alcohol use for low-stress patients, and habitual tobacco use for high-stress patients. As a possible explanation, it is noted that Table 2 shows many

interpersonally relevant predictors for the low-stress improvers, compared with relatively few for the high-stress improvers (Table 3). Given than alcohol and tobacco are, broadly speaking, utilized as stress reducers, it is consistent that the high-stress patients utilized the more socially related behavior (alcohol), versus a non-personal stress reducer (smoking) by the high-stress improvers. It is noted that "social drinking only" was shown to be a specific predictor of success for the former group.

Several limitations of the present study should be recognized. First, in regard to the follow-up data, it is noted that the procedures for obtaining participants' weight after three years were somewhat rudimentary. This would have had the potential effect of reducing the reliability of these data. In future work, it might be preferable to obtain this information in the context of individual in-person interviews. A second issue involves the considerable variability in the extent to which patients participated in post-operative support groups and individual counseling. The effects of this activity on ultimate outcome remain unknown. Third, it is recognized that the study utilized a large number of predictors, yielding a comparatively small number of significant correlations (although greater than would have been expected by chance alone). While none of these limitations are likely to have biased the basic findings of the study, they should be taken in to consideration in future research of this nature.

The results of the present study add to previous findings that useful moderators can be found for enhancing pre-operative prediction of outcome in GBS. It would be of interest to investigate these variables (health status, life-stress) and possibly others (e.g., general psychological adjustment) for their possible relevance in improving outcome predictions in other significant life interventions, whether surgical or of another type.

Statement Regarding Conflict of Interest

Richard I. Lanyon: Receives royalties from the sale of the Multidimensional heath Profile; Barbara M. Maxwell: No conflict of interest.

Statement of Informed Consent

Informed consent was obtained from all individual participants included in the study.

Statement of Human Rights

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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