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Triggers of Lapse and Relapse of Diet and Physical Activity in Behavioral Weight Loss

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Abstract

Objectives: 1) develop instruments to evaluate situations that lead to lapse and relapse in diet and exercise, and; 2) prospectively investigate when and which psychosocial situations predict failure to lose weight in a clinical trial of intentional weight loss.

Methods: —Developed instruments to identify triggers to lapse and relapse in diet and physical activity. Participants were 469 individuals with overweight or obesity participating in a behavioral weight-loss program (age M=53.6 years, SD=11.4, Body Mass Index [BMI] M=35.7 kg/m², SD=6.5).

Results: Cronbach's alpha for the Diet scale was .93; Physical Activity scale, .91. Subscale alphas ranged from .60 to .96. Lapse and relapse were assessed at three and nine months for associations with weight loss at 12 months. At nine months, Diet triggers were: Negative Emotional States (Beta=.11, p=.02), and Urges (Beta=.14, p=.01). Predicted Social Situations were opposite:(Beta=−.09, p=.02). Physical Activity subscales were all NS.

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Conclusions: Findings suggest the ongoing importance of addressing Negative Emotional States and the contributing influence of Urges. The novel finding that participants whose difficulties arise in Social Situations may do better over time than those who do not requires further study.

Keywords

Lapse; Relapse; Diet; Physical Activity; Weight Loss

Introduction

Relapse Prevention has influenced the conceptualization and treatment of addictive processes (1,2,3). Rather than viewing the first instance of abstinence violation as failure, Relapse Prevention enables a cognitive-behavioral analysis of steps leading up to violation, planning to avoid similar violations, modifying extreme emotional response to violations, and improving coping with future temptations. Lapse is seen as a brief violation of abstinence, and relapse as a longer, more serious violation; e.g.: in diet, more than a day, in exercise, more than a week (3). The growing view that food has addictive qualities (4) suggests that a taxonomy of tempting situations could be beneficial to obesity prevention and treatment in the way that Shiffman's (5) taxonomy has been in smoking cessation. Grenard, et al. (6) applied Shiffman's approach to snacking and found that sweet drink consumption was associated with exercising.

Previous research in weight control has found that mood states and emotions have an important role in obstructing weight loss and in triggering relapse (7,8). Negative emotional states were associated with relapse (9). Increased stress, tension, sadness, and feeling less in control were associated with both temptations and lapses (10) in a population with type 2 diabetes in a formal weight loss program. Ecological momentary assessment, the repeated sampling of subjects' experiences and behaviors in real time in their natural environments, is an important methodological improvement (7). The application of Shiffman's lapse and relapse cues in more traditional scaled psychometric categories of relapse crises could provide a different perspective of measurement and prediction in the context of treatment phases.

The objectives of the present study were to: 1) develop instruments to measure psychosocial events that precede lapse and relapse in adherence to diet and exercise; and 2) prospectively investigate when and what type of incidents predict early and late issues that interfere with weight loss.

METHOD

Instrument Development and Statistical Analyses

Items and conceptualization from Shiffman's (5) analysis of smoking to diet and exercise were adapted by an expert panel of nutritionists, psychologists, and physicians involved in weight control research, and then tested. Principal component analysis with Varimax rotation was used on the initial sample to determine instrument factor structures. Items were

rewritten or discarded based on: item difficulty; item reliability/consistency; instrument alpha (if item deleted); and item discriminability (13).

Factors were later reduced by confirmatory factor analysis (CFA) and model fit on the final sample (14). Missing values were replaced by imputed grand means for the CFA. Cronbach's alpha was used to estimate reliability in the final scales. Linear multiple regression was used to determine which perceived lapse and relapse triggers at 3 months and 9 months were associated with weight change at 12 months.

Procedures

Participants were followed for 12 months and assessed as part of an evaluation for a weight loss program at 3 and 9 months for incidents preceding lapse and relapse to diet adherence. The parent study, MODELS (11) was a clinical trial with three arms and levels of intensity: workbook-only control; expert computer system for weight loss plus workbook; and the computer system plus staff intervention and workbook. This paper presents secondary analyses of completers, not the clinical trial results. The intervention was weekly for three months, and monthly for the duration, with frequency and intensity raised if participants relapsed. The workbook was later published (12). For participants who completed their one-year visit and had complete cost data (N=434), the mean cost per pound lost was \$6.23 for the workbook-only group, \$8.57 for the intermediate attention group, and \$18.78 for the most intensive group. The trial was reviewed by the Albert Einstein College of Medicine Institutional Review Board.

Participants

Participants (N = 588) were men and women recruited from a freestanding Health Maintenance Organization (HMO) using physician referrals, newsletter articles, flyers, community advertisements, and local media news coverage. Participants had overweight or obesity and enrolled in a 12-month weight loss trial. Eligibility included: BMI>25, or >24+one cardiovascular risk factor; and a willingness to follow the study protocol, which included a refundable \$100 deposit, returned at completion. Exclusions included: intentions to move beyond commuting distance in the next 12 months; and medical conditions that would interfere with study participation. The 469 who completed 12 months were included in this study. Detailed information regarding selection process of participants can be found in Wylie-Rosett, et.al. (11). The demographic and weight category characteristics of participants are summarized in Table 4.

Measures

Weight status.—Weight to 0.1 lbs. and height were assessed using standardized procedures on a balance beam scale and stadiometer respectively at baseline, and follow-up weights were obtained at 3, 6, 9, and 12 months or quarterly during the year-long intervention. Shoes were removed and light clothing was worn to take measurements. Weight and height measurements were then used to calculate body mass index (BMI).

RESULTS

Diet and Exercise Lapse and Relapse Scales

Cronbach's alpha values for the final Diet and Exercise scales were .93 for Diet and .91 for Physical Activity; subscales ranged from .60 to .96. The initial Diet scale had 50 items and the initial Physical Activity scale had 39. Confirmatory factor analysis reduced the Diet scale to 32 items and the Physical Activity to 36. Model fit (14) of Diet yielded a CMIN/df=1.96 with GFI=.89, AGFI=.87, CFI=.95, PCFI=.84, RMSEA=.04, and PCLOSE=1.00. The p for the whole model=.001, but it is unlikely a model with this large an N would show $p>.05$. The final Diet Triggers Scale is shown in Table 1.

Model fit of Exercise yielded a CMIN/df=2.01 with GFI=.91, AGFI=.88, CFI=.95, PCFI=.83, RMSEA=.05, and PCLOSE=.98. The p for the whole model=.01, but it is unlikely a model with this large an N would show $p>.05$.

Items and Cronbach's alphas for Physical Activity triggers are presented in Table 2.

Regression Analyses

To determine which lapse and relapse triggers discriminated successful from unsuccessful weight loss, we performed linear multiple regression analyses to see which subscales were associated with weight change. We performed regression analyses on three-month and nine-month lapse and relapse because early relapse could be an important clinical tool to better engage early dropouts. Predictor variables in both diet and exercise were the subscales in each. There were no covariates.

Regressions of 12-month weight change on 3-month lapse triggers of both Diet and Exercise were nonsignificant. Regression of 12-month weight change on 9-month lapse triggers of Diet showed lapses triggered by Negative Emotions and Urges, with Social Situations significant in the opposite direction (Table 3).

Regression of Exercise Lapse Triggers at 9 months on Weight Change at 12 months is NS (Table 3).

To examine the possible effect of intervention intensity on results, we performed ANOVA with Negative Emotion, Urges, and Time Pressure as the independent variables and intensity of intervention as the dependent variable, but the results were not significant.

DISCUSSION

Early lapse and relapse triggers did not predict weight change. Later issues encountered up to nine months included Negative Emotional States in Diet. This suggests the ongoing importance of addressing Negative Emotional States and the possibility of addressing the addictive properties of particular foods. These are similar to Shiffman's and others' (2,3,5,6,7,8) findings and reinforce the importance of teaching people with weight problems techniques other than eating to cope with negative emotions. Exercise may buffer negative emotions and some with emotional problems may engage in more exercise and fitness activities (15).

The novel finding that participants who had difficulties with eating in social situations actually lose more weight than people who don't raises many questions. Social situations may be more conducive to learning new adaptations than situations of negative emotion or situations in which one is coping with urges without social support. Social cues may reinforce moderation of eating.

Behavioral Compensation may lead to increased efforts towards weight loss following the event, or social reinforcement of success may be a factor, whether their social networks were supportive and/or sabotaging.

Participants who engage in social situations may have less depression than those who did not, and thus have fewer negative emotions challenging their coping skills.

Skills learned may generalize to more situations. We found in another study of the same participants that those who lost weight had an increased sense of vitality which encouraged them to lose more weight (16). Participants who find it challenging to learn how to eat carefully in social situations may be able to learn to integrate the pleasure of eating with social interaction, and develop relational eating patterns rather than just negative, reactive, prohibitive ones.

The failure to find any relation between three-month triggers and twelve-month weight change is puzzling. Participants were exposed to the concepts of lapse, relapse, and triggers in the workbook, the computer program, and by the staff. The three-month evaluation was the first time they were asked about these concepts and their role in their lives, and may have reinforced skills available to them. They may have needed the extra time to integrate the concepts and have been more able by nine months.

We hope that our instruments are adopted for clinical purposes, to help identify areas where individuals need help, and for research purposes, to further understand the processes by which people in intentional weight loss encounter and cope with lapse and relapses to diet and exercise.

Limitations

Our data were collected in 1998 and computer systems used may be outdated. We had only 12-month follow-up and limited demographics. The \$100 deposit may have affected the credibility of self-report data. Our findings are strengthened by being consistent with similar findings in smoking (5), and other papers on weight control (2,3,6,7,8,9,10). Our algorithms were individually tailored and relied on Stages of Change, progress in weight change, knowledge, and self-efficacy, similar to more recent computer-assisted weight loss programs. The lack of association between lapse/relapse triggers at month 3 and weight change at month 12 is problematic. In the context of modest associations observed for month 9 triggers, questions arise about the significance, robustness, and consistency of the results presented. This begs replication.

The regressions of triggers on weight change account for about 5% of the variance. Weight self-regulation is highly complex with genetic, environmental, cognitive, behavioral, and

other factors. Small effects, over long periods of time, can result in the individually variable and unstable results we see in weight control. These effects can be conceptualized as making incremental contributions to weight change in the ways that Framingham-type risk factors make to cardiovascular disease. These accumulate over many years and have long-term effects as exercise does on weight.

Conclusions

Dieters and exercisers report no associated triggers to lapses or relapses in the first three months re: weight change. Negative emotional States, Urges, and Dietary adherence in social situations at nine months are associated with weight change at 12 months. Difficulties in adherence to diet in social situations was positively associated with weight loss at 12 months. Concurrent assessment and treatment of depression and negative emotional states may improve long-term weight loss and its consequent contribution to avoiding the health sequelae of overweight and obesity.

This suggests the ongoing importance of addressing Negative Emotional States and Urges, and the possible importance of addressing the ways people learn to eat in Social Situations.

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Study Importance Questions:**What is already known about this subject?**

- Negative Emotions are confirmed to be the most common cause of lapse and relapse in adherence to diet and exercise.

What does your study add? This study:

- Supports Negative Emotions as situational triggers to lapse and relapse and adds the possibility that situations with specific Temptations and Urges are major triggers;
- Provides new instruments to identify triggers of lapse and relapse which we hope other researchers and clinicians will use; and
- Finds that participants who are triggered in in Social Situations may be more successful at weight control than participants who are triggered by negative emotions

Table 1**Diet Lapse and Relapse Triggers Scale and Subscales with Item Factor Loadings and Cronbach's Alphas**

People lead busy lives, with many demands, making it difficult for them to do the things they would like to do. They are too busy to plan and do not have time to eat healthfully. Listed below are a number of ways in which life's problems can interfere with eating properly. For this initial response, please think about all the times you have tried to lose weight in the past.		
PLEASE CIRCLE THE NUMBER THAT REFLECTS YOUR BELIEF		
0=NEVER 1=SOMETIMES 2=OFTEN 3=ALWAYS		
	Item Factor Loading	Cronbach's Alpha
Diet Lapse and relapses Scale		.93
<u>A. Negative Emotions Subscale</u>		.93
Have any of these been problems for you when trying to lose weight?		
1. sad/depressed/blue/down	.81	
2. nervous/edgy/tense/anxious	.78	
3. discouraged/frustrated	.76	
4. angry	.82	
5. worried	.81	
6. upset	.83	
7. feeling grief or loss	.69	
8. bored	.54	
9. lonely	.62	
10. guilty	.68	
11. stressed	.82	
12. rushed	.69	
<u>B. Negative Physical States Subscale</u>		.60
Has it been a problem trying to lose weight because you are...		
1. fatigued/tired	.94	
2. suffering from specific disorders, e.g. pms or headaches	.47	
<u>C. Positive Emotions Subscale</u>		.96
How much of a problem have any of these been for you when trying to lose weight?		
1. Feeling joyful	.91	
2. feeling pleased	.94	
3. feeling free	.90	
4. feeling happy	.94	
<u>D. Urges and Temptations Subscale</u>		.83
How much of a problem have any of these been for you when trying to lose weight?		
1. Dealing with tempting, high calorie foods	.71	
2. dessert	.61	
3. limiting portion size	.58	
4. avoiding fast food	.49	
5. avoiding prepared snack food	.62	
6. avoiding high calorie snacks	.78	

7. avoiding fried foods	.63
8. avoiding high fat foods like chocolate/ ice cream	.64
9. coping with medical dietary restrictions	.33
9. lonely	.62
E. Time Pressure Subscale	.82
Has losing weight been hard for you because of...	
1. too many family duties	.81
2. finding time to keep a food diary	.58
3. too many meetings	.67
4. finding time for family	.76
5. finding time for recreation and entertainment	.77
F. Social Situations Subscale	.80
When trying to lose weight how often has it been a problem? Overeating when:	
1. eating in social situations	.73
2. cooking for others	.59
3. eating out	.67
4. eating at others' houses	.82

Table 2

Exercise Lapse and Relapse Triggers Scale and Subscales with Factor Loadings and Cronbach's Alphas

People lead busy lives, with many demands, making it difficult for them to do the things they would like to do. Listed below are a number of ways in which life's problems and your beliefs can interfere in taking part in physical activity. For this initial response, please think about all the times you have tried to start an activity program in the past.		
PLEASE CIRCLE THE NUMBER THAT REFLECTS YOUR BELIEF		
0=NEVER 1=SOMETIMES 2=OFTEN 3=ALWAYS		
	Item Factor Loading	Cronbach's Alpha
Exercise Lapse and relapses Scale		.91
How often has it been a problem to take part in physical activity because you felt...		
A. Negative Emotions Subscale		.92
1. sad/depressed/blue/down	.82	
2. nervous/edgy/tense/anxious	.84	
3. discouraged/frustrated	.77	
4. angry	.84	
5. worried	.84	
6. bored	.68	
7. upset	.85	
8. lonely	.59	
9. guilty	.66	
10. grief or loss	.67	
B. Negative Physical States Subscale		.78
How often has it been a problem to take part in physical activity because you...		
1. have a chronic condition	.81	
2. have an injury	.59	
3. are in pain	.73	
4. are ill	.53	
C. Negative Self-Image		.85
1. are embarrassed	.79	
2. can't find appropriate clothing	.70	
3. do not like to change clothes in a group locker with other people	.60	
4. feel clumsy compared to most people	.79	
D. Dislike Exercise Subscale		.81
How often has it been a problem to take part in physical activity because you...		
1. do not like to sweat	.56	
2. prefer to watch television	.63	
3. think it is boring	.69	
4. think it is a waste of time	.60	
5. prefer to eat less to lose weight	.60	
6. do not enjoy it	.70	
7. are afraid it will increase your appetite	.47	
E. Social Situations		.86
How often has it been a problem to take part in physical activity because of...		
1. meeting social obligations	.68	
2. the health of a family member	.36	
3. problems with children	.48	
4. family responsibilities	.66	
5. too many things to do	.87	
6. too many interruptions	.86	
7. being hassled/rushed	.89	

Table 3

Linear Regressions of Weight Change at 12 Months on Lapse and Relapse Triggers at 9 months Diet Triggers (top) and Exercise Triggers (bottom)

R=.22	R ² =.05	Adjusted R ² =.04	SE=14.61		
Regression	SS 8820.37	df=6	MS 1470.06	F=6.88	p=.001
Residual	SS 173184.84	df=455	MS 213.55		
Total	SS 182005.205	df=461			
	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	SE	Beta		
Negative Emotional States	.20	.08	.11	2.43	.02
Negative Physical States	.16	.38	.02	.41	.68
Positive Emotional States	-.02	.19	-.00	-.09	.93
Urges and Temptations	.40	.13	.14	3.09	.01
Time Pressure	.21	.16	.06	1.37	.17
Social Situations	-.50	.22	-.09	-2.31	.02
<u>Exercise Triggers</u>					
R=.13	R ² =.02	Adjusted R ² =.01	SE=15.13		
Regression	SS 1876.63	df=5	MS 375.33	F=1.64	p=.15
Residual	SS 104640.35	df=457	MS 228.97		
Total	SS 106516.98	df=462			
	Unstandardized Coefficients		Standardized Coefficients	t	p
	B	SE	Beta		
Negative Emotional States	.16	.13	.06	1.16	.25
Negative Physical States	-.33	.26	-.06	-1.25	.21
Self-Image	-.59	.33	-.10	-1.80	.07
Dislike Exercise	.34	.22	.09	1.52	.13
Social Situations	.14	.16	.05	.92	.36

Table 4

Participant Demographic Characteristics: Completers and Drop-Outs

<u>Characteristic</u>	<u>Completers</u> Mean $\pm$ SD	<u>Completers (n=469) %</u>	<u>Drop-outs</u> Mean $\pm$ SD	<u>Drop-outs (n=113)(n) %</u>	<u>t-tests and χ^2</u> <u>Completers vs. Drop-</u> <u>outs</u>
Gender					$\chi^2 (1) = .05, p = .83$
Female		(386) 82.3		(92) 81.4	
Male		(83) 17.7		(21) 18.6	
Age (y)	53.6 $\pm$ 11.4		46.5 $\pm$ 11.2		t (582) = 6.0, p<.01
BMI	35.7 $\pm$ 6.5		36.1 $\pm$ 6.3		t (582) = -0.6, p=.51
25–29.9 Overweight		(92) 19.6		(22) 19.4	
30–34.9 Class I Obesity		(159) 33.9		(33) 29.2	
35–39.9 Class II Obesity		(113) 24.1		(32) 28.3	
40+ Morbid Obesity		(105) 22.4		(26) 23.0	
Ethnicity					$\chi^2 (7) = 15.34, p < .05$
White		(394) 84.0		(89) 78.8	
African American		(46) 9.8		(17) 15.0	
Hispanic		(14) 3.0		(1) 0.1	
Asian/Pacific Islander		(4) 1.0		(3) 2.7	
Other		(11) 2.3		(3) 2.7	
Education					$\chi^2 (4) = 3.88, p = .42$
Grade 10–11 H.S.		(3) 0.6		(0) 0.0	
H.S. Degree		(77) 16.4		(12) 10.6	
1+yr H.S.		(116) 24.7		(26) 23.0	
College Degree		(117) 24.9		(33) 29.2	
Graduate Degree		(156) 33.3		(42) 37.2	
Marital Status					$\chi^2 (3) = 2.72, p = .44$
Single		(68) 14.5		(23) 20.4	
Married		(322) 68.7		(71) 62.8	
Divorced		(49) 10.4		(13) 11.5	
Widowed		(30) 6.4		(6) 5.3	
Religion					$\chi^2 (4) = 5.39, p = .25$
Catholic		(125) 26.7		(36) 31.9	
Jewish		(152) 32.4		(35) 31.0	
Protestant		(36) 7.7		(15) 13.3	
None		(14) 2.5		(8) 7.1	
Other		(18) 3.8		(5) 4.4	
No Response		(124) 26.4		(14) 12.4	