

## Evaluating Effectiveness of Perceived Long-Term Behavior Change using Self-Determination Theory

Emily Seferovich BS<sup>1</sup>, Amy Sercel BS<sup>1</sup>, Kari Anderson DBH LPC CEDS<sup>2</sup>, Peter Callas PhD<sup>3</sup>, Amy Nickerson MS RD<sup>4</sup>

<sup>1</sup>MSD Students, University of Vermont <sup>2</sup>Chief Clinical Director, Green Mountain at Fox Run <sup>3</sup>Research Associate Professor, University of Vermont <sup>4</sup>Senior Lecturer and Director of the MS in Dietetics Program, University of Vermont

### Abstract:

The Self-determination theory (SDT) states that an individual's social context influences autonomy, competence, and relatedness, which can ultimately impact their sense of health and well-being. Environments that hinder an individual's capacity to achieve these three psychological needs may have negative ramifications on his or her wellness. Green Mountain at Fox Run (GMFR), a residential retreat for women with binge eating disorder, espouses the principles of SDT to foster long-term healthy relationships with food and body image.

This study sought to evaluate the extent to which program alumnae maintained long-term behavior change modeled and experienced at GMFR. Investigators developed a survey that included eight Likert scale questions related to each construct of SDT, one question about their overall experience at GMFR, and four demographic questions. Following approval from the University of Vermont's Institutional Review Board, an email inviting online survey completion was sent to all GMFR alumnae from the past ten years, and invalid email addresses were excluded (n=4,848). **Four hundred thirty two surveys were completed for a response rate of nearly 9%.**

Preliminary findings demonstrated mixed long-term outcomes (indifferent-to-positive) for the competence and relatedness constructs, and **a positive long-term outcome for the autonomy construct, suggesting that alumnae gained a sense of control over food choices as a result of their experience at GMFR. These outcomes indicate that residential interventions using an SDT framework hold the potential to facilitate long-term health behavior change in women with binge eating disorder.**

## Literature Review:

### I. Introduction to the Study

Binge eating disorder (BED) is the most prevalent eating disorder in the United States, impacting 3.5% of women. BED defined as having “episodes of eating in which an individual rapidly consumes excessive amounts of high-energy foods and feels a sense of loss of control over his or her eating behavior.”<sup>1</sup> Individuals frequently experience feelings of shame, distress, or guilt in the aftermath of a binge.<sup>2</sup>

Green Mountain at Fox Run (GMFR), located in Ludlow, Vermont, is a residential weight loss retreat and eating disorder clinic that specializes in aiding women’s recovery from BED through the promotion of mindfulness, physical activity, and a non-dieting approach towards food choices. The camaraderie, course offerings, individual and group counseling sessions, and immersive experience at GMFR are designed around the Self-Determination Theory (SDT) framework of behavior change with the goal of helping participants achieve sustainable recovery and long-term health behavior maintenance. This framework suggests that individuals have innate psychological needs for autonomy, competence, and relatedness.<sup>3,4</sup>

Autonomy is an individual’s capacity to make an informed, self-governed decision when determining behaviors. Competence is an individual’s ability to successfully and effectively interact with his or her environment. In the context of eating behaviors, competent eaters have 1) positive attitudes about eating and about food, 2) food acceptance skills that support eating an ever-increasing variety of the available food, 3) internal regulation skills that allow intuitively consuming enough food to give energy and stamina and to support stable body weight, and 4) skills and resources for managing the food context and orchestrating family meals.<sup>5</sup> Relatedness is associated with the development and maintenance of close personal relationships as well as

belonging to groups, and has been considered the most important factor in developing and nurturing close relationships with others. If these needs are not satisfied, SDT argues that an individual will not be motivated to engage in positive and fulfilling behaviors, and therefore will be unable to experience wellness.<sup>6,7</sup> As the counseling and education strategies used at GMFR are designed on the basis of SDT, they are intended to aid participants in the management of BED by providing them with techniques to satisfy the psychological needs for autonomy, competence, and relatedness.

Previous research has indicated that disordered eating and binge eating behaviors may be related to a lack of fulfillment of the basic psychological needs outlined by SDT.

When an individual is unable to fulfill his or her needs for autonomy, competence, or relatedness, he or she may turn to food as a coping mechanism. This phenomenon has been commonly noted in individuals who have been diagnosed with binge eating disorder. The research also demonstrated that people who do not have diagnosed binge eating disorders may also turn to food as a coping mechanism.<sup>1,8</sup>

The current study was designed to measure the long-term effectiveness of the GMFR experience on past participants' autonomy, competence, and relatedness with respect to their food choices.

## II. Self-Determination Theory

The behavior change framework proposed by SDT attempts to explain individuals' desires and levels of motivation to engage in certain health-related behaviors. SDT focuses on the processes in which an individual's social and physical environment promote or hinder a sense of motivation, and the degree to which that motivation exists. Motivation, defined as the extent to which an individual is driven to take a certain action, can be either intrinsic or extrinsic. Intrinsic motivation originates from within the individual and leads to behaviors that are personally interesting and

satisfying. Extrinsic motivation originates from factors external to the individual; behaviors categorized by this type of motivation are usually performed to achieve a reward or avoid punishment.<sup>3</sup> While extrinsic motivation can effectively produce behavior change in the short term, it does not produce long-term behavior change as effectively as intrinsic motivation,<sup>9</sup> largely because these behaviors are driven by external versus internal factors. Motivation is more likely to shift from extrinsic to intrinsic when the needs for competence, autonomy, and relatedness are satisfied.<sup>6</sup> Through engaging the tenets of SDT, GMFR has the potential to help women shift from extrinsically motivated behaviors to intrinsically motivated behaviors, which can aid in the control of chronic binge eating behaviors.

Previous research has utilized survey tools to assess the association between SDT and motivation to engage in positive behaviors. These positive behaviors relate to activities that range from physical activity to food choices, schoolwork, job searching, and more. Hrbackova and colleagues employed a survey tool to assess the degree to which motivation is internalized among university students of various academic disciplines. Questions were categorized according to intrinsic or extrinsic motivation, perceived success, self-efficacy, and sources of potential success. Their survey did not assess the degree to which students' needs for autonomy, relatedness, or competence were met; however their survey design measured various constructs of SDT to determine motivation to engage in positive behaviors. These methods were similar to those employed in the current study.<sup>3</sup>

In another study by Gourlan and colleagues, motivation and perceived levels of competence, autonomy, and relatedness while participating in physical activities among obese adolescents were assessed using a multiple-choice survey. Researchers found satisfying the need for autonomy was most influential on a person's level of motivation, closely followed by relatedness. Participants were more likely to feel intrinsically motivated to engage in a physical activity if they felt control over the

activity and duration, and had close relationships with others participating in the same activity. Furthermore, need thwarting, or the lack of ability to satisfy one of these psychological needs, was associated with a decrease in motivation to engage in physical activity among this population.<sup>4</sup>

In yet another study, Custers and colleagues assessed the importance of autonomy, competence, and relatedness in the caring relationship between residents and nursing staff at a long-term care facility. Researchers administered a 9-question survey to participants, with three questions associated with each psychological need.

Participants chose from a 5-point Likert scale in order to rate the importance of each need. Researchers analyzed survey results by calculating the mean response for each question, then aggregating the results by construct. This study assessed current attitudes regarding the value of each construct. Although fulfillment of all constructs was determined to be important, relatedness was the most valued need, followed by competence, and then autonomy.<sup>10</sup> Similarly, the current study will assess participant abilities to fulfill their own individual needs using a Likert scale-style questionnaire.

### III. Self-Determination Theory and Weight Loss

SDT seeks to explain why certain individuals have more difficulty losing weight or maintaining weight loss effectively compared to others. Most studies examining the effectiveness of SDT to facilitate weight loss note the influence of autonomy in creating internalized goals. Two previous studies suggest that individuals became more motivated to achieve autonomously-created goals than goals that were externally imposed.<sup>11,12</sup> In that context, autonomously created goals were pursued to fulfill an internal need (such as to augment health) rather than fulfill an external demand (such as to achieve a socially-acceptable body weight).

In a study by Hartmann and colleagues, 2,917 adults in Switzerland were surveyed about their eating and physical activity behaviors. Participants' desire for a healthy

lifestyle and attitudes about autonomy, relatedness, and competence were also assessed. The survey was repeated annually for four years. Researchers found that health-related behaviors and weight loss were not impacted by concern for health alone. Furthermore, individuals were less motivated to improve health when they reported a higher degree of extrinsic motivation. Conversely, individuals who reported a higher sense of autonomy, a psychological need associated with “consistent behavior and effective performance,”<sup>11</sup> were more likely to consume fruits and vegetables and less likely to consume sweets. Men with higher levels of autonomy were also more likely to report engaging in physical activity for fun. These results suggested that weight maintenance strategies may be more effective when individuals have a higher sense of autonomy,<sup>7</sup> and increasing autonomy may lead to a greater adoption of health-related behaviors for weight management.

A similar study by Teixeira and colleagues argued that current treatments for obesity tend to neglect the impact of motivation in making and maintaining dietary changes. Researchers suggested that focusing an intervention on an individual’s motivations for changing would result in more significant changes. In their 6-month study, participants adhered to a low-calorie diet and were provided with counseling and peer support to facilitate weight loss. Following completion, participants with a higher autonomy and greater sense of support for their autonomy were more likely to continue employing weight loss techniques.<sup>12</sup> Researchers determined that discussing goals and rationale for pursuing weight loss prior to a weight management intervention enhanced participant interest lifestyle changes by enhancing participant engagement with the intervention.

#### IV. Self-Determination Theory and Eating Disorders

In a study by Verstuyf and colleagues, 302 females between the ages of 14 and 23, who had never been diagnosed with an eating disorder, were asked to keep a diary of

eating behaviors and emotions for 14 consecutive days. When analyzed, it was found that women engaged in more binge eating behaviors on days when their needs for autonomy, competence, or relatedness were frustrated. Significantly, researchers found that need thwarting only influenced eating behaviors within one day; if a need was not met one day, a woman would not compensate with binge eating behaviors the following day. Furthermore, diaries indicated that frustration of the need for relatedness was most strongly associated with binge eating symptoms.<sup>8</sup>

Schuler and colleagues noted that lack of need satisfaction can trigger the desire to engage in binge eating behaviors. In an online survey of 52 men and 88 women, researchers measured whether degree of competence influenced the desire to eat in response to need thwarting. In that study, people whose needs were satisfied were significantly less likely to have the impulse to eat or binge eat and were less likely to report feeling compelled to eat in response to a need-thwarting event.<sup>1</sup>

Previous studies have shown that individuals with unmet needs for autonomy, competence, and relatedness, as outlined by SDT, are less likely to be intrinsically motivated to reach health-related goals.<sup>3,8,11</sup> Simultaneously, these same individuals are more likely to engage in binge eating behaviors.<sup>1,8</sup> Programs that enhance an individual's ability to meet these needs and emphasize the development of intrinsically meaningful goals will likely have a greater impact on participants' ability to maintain health-related behaviors over the long term.<sup>11,12</sup>

## V. Introduction to the Current Study

The program at GMFR was designed based upon SDT in order to help women develop the ability to meet their psychological needs for autonomy, competence, and relatedness, and therefore manage binge eating behaviors. The design of the present survey was informed by previous studies that sought to assess individuals' levels of

motivation and value of each psychological need. It may be the first study to measure the long-term effectiveness of a program based upon enhancing selected constructs of SDT to facilitate recovery from BED. GMFR's unique residential setting in which participants are immersed in an environment that enhances autonomy, competence, and relatedness for the duration of their stay may have implications on long-term health behavior maintenance, as it may allow them to adopt principles of intuitive eating and health behaviors more effectively than a non-residential intervention. Consequently, this study sought to provide insight into further applications for SDT in relation to recovery from BED and the maintenance of health behaviors.

Methods:

Survey Design and Sample:

GMFR initiated and approved this project prior to development and administration of the survey. The survey was drafted by the two principle investigators and reviewed by each author for clarity and accuracy; eight drafts of the survey were reviewed with feedback from administrative staff and faculty at GMFR and the University of Vermont Department of Nutrition and Food Sciences. A statistics professor at the University of Vermont also assisted with survey design and revision. The ninth rendition was approved by all members of the research committee. The University of Vermont Institutional Review Board approved the survey design and administration method.

The 13-question survey included four demographic questions to allow for analysis based on participant characteristics. The remaining nine questions were written in a Likert Scale format and addressed various constructs of the SDT; three questions asked about relatedness and competence, and two questions were asked about autonomy. The final question served as an overall measure of participants' experience at GMFR, and was unrelated to a specific construct of the SDT (Table 1). To answer, participants

selected the extent to which they agreed or disagreed with the question via a Likert scale, with one indicating “Completely Disagree” and five indicating “Completely Agree.” Some questions were “reversed,” or phrased in the negative in order to decrease invariant responding, and were inverted for purposes of the analysis. In order to reduce the risk of survey fatigue and ensure that the maximum number of participants would choose to respond, the survey was kept as short as possible while addressing all constructs of Self-Determination Theory.

<b>Survey Questions</b>
<p><b>Demographic Questions</b></p> <p>1. What is your age?</p> <p>2. How long ago were you last at GMFR?</p> <p>3. Within the past five years, how many times have you stayed at GMFR?</p> <p>4. What is the cumulative length of all of your stays at GMFR?</p>
<p><b>Relatedness</b></p> <p>5. As a result of my stay at GMFR, I am more likely to seek out social interaction.</p> <p>6. My experience at GMFR did not increase my confidence when relating to others</p> <p>7. My experience at GMFR helped me recognize that I am not alone in having a difficult relationship with food.</p>
<p><b>Autonomy</b></p> <p>8. As a result of my experience at GMFR, I am more mindful about my food-related decisions*.</p> <p>9. My stay at GMFR had little impact on my confidence to make my own food-related decisions*.</p>
<p><b>Competence</b></p> <p>10. As a result of my experience at GMFR, I am more capable of making food-related decisions* that make me feel good emotionally.</p> <p>11. As a result of my experience at GMFR, I am more capable of making food-related decisions* that make me feel good physically.</p> <p>12. As a result of my experience at GMFR, I am less likely to use overeating to cope with stressful situations.</p>
<p><b>General Impact of GMFR</b></p> <p>13. Overall, my experience at GMFR had little impact on my ability to adopt a lifestyle that includes making healthy choices.</p>

Table 1: Survey questions, separated by the construct or main topic to which they pertain.

A link to the survey was sent out via email to everyone who had participated in a program at GMFR within the past ten years (n=5,091). The email also contained an invitation letter explaining the nature of the survey, assuring anonymity, and requesting

that responses be returned within one week. Invitations to participate were sent only once due to GMFR's desire to reduce survey fatigue among past participants. Consent was implied by participants' decision to open the link embedded in the email. The invitation stipulated that participants only respond to the survey once to prevent dilution of the results. Due to a limitation of the survey program, it was not possible to send out more than 1,000 surveys per day. Emails were staggered, with approximately nearly 1000 sent out daily for six days. Of the messages sent, 243 email addresses were found to be invalid. Thus, the final sample was 4,848 valid individuals. The researchers were not provided with respondent identification by the survey program, which participant anonymity.

#### Statistical Analysis:

Results were reported and analyzed using Microsoft Excel and STATA Statistics Software. Data were analyzed according to participant age, cumulative length of stay at GMFR, time since last stay at GMFR, and SDT construct. Participant demographics were collected by determining the average participant age and distribution of responses for time since last stay at GMFR and cumulative length of stays.

Prior to data analysis, it was determined that selection of any value greater than 3 on the Likert Scale indicated a favorable response. Distribution of responses was determined by calculating the percentage of participants who selected each Likert Scale score for each question. Percentage of favorable responses was determined for each question, and values were aggregated by construct in order to find the percentage of participants that responded favorably to questions assessing each construct. For each Likert Scale question, mean response was calculated. Questions were aggregated by construct in order to find an overall mean for each. In order to determine whether mean responses to each construct were significantly different, independent sample t-tests were performed.

A bivariate analysis using linear regression and design variables was conducted to determine the existence of association between age, cumulative length of stay at GMFR, and time since last stay at GMFR for each aggregated SDT construct score.

Results:

Of 4,848 valid emails, a total of 485 surveys were returned for a response rate of 10%. Ages of participants ranged from 16 to 82 years, with an average age of 54.9 years. Additional participant demographics are listed in Table 2. The majority of participants last stayed at GMFR more than five years ago (n=209), and the most common length of stay was two weeks (n=109).

Participant Demographics					
How long ago did you last stay at GMFR?					
< 1 year	1-2 years	3-4 years	>5 years	No Response	
15.7%	16.7%	19.0%	43.1%	5.6%	
What is the cumulative length of all of your stays at GMFR?					
1 week	2 weeks	3 weeks	4 weeks	>1 month	No Response
22.1%	22.5%	11.1%	21.2%	16.7%	6.3%

Table 2: Distribution of participant responses based on time since last stay at GMFR and cumulative length of all stays at GMFR.

Mean responses for each question were aggregated by construct (where applicable). Using the 5-point Likert Scale where 1= strongly disagree and 5= strongly agree, the average aggregated response to questions that assessed relatedness, autonomy, and competence were 3.45, 3.73, and 3.39, respectively. Prior to data analysis, it was determined that a favorable response was any value greater than three on the Likert Scale, meaning that the response was in agreement with the statement. For example,

a response of 4 to the question “As a result of my stay, I am more likely to seek out social interaction” would indicate that GMFR had a favorable impact on that individual’s relatedness.

The percentage of responses greater than three was calculated for each question and then aggregated for each construct. The findings suggest that more than half of participants favorably evaluated GMFR’s impact on their autonomy (59%). Similarly, 50% of respondents favorably evaluated GMFR’s impact on their relatedness, and nearly half (47.8%) favorably evaluated GMFR’s impact on their competence (Table 3).

<b>Percentages of Respondents who Selected Each Likert Scale Score by Question</b>									
Question Number Likert Scale Score	Relatedness			Autonomy		Competence			14
	6	7	8	9	10	11	12	13	
1	22.1%	13.0%	3.5%	6.4%	7.8%	8.0%	7.2%	12.8%	9.9%
2	12.0%	9.9%	3.3%	7.0%	10.3%	9.5%	8.9%	14.0%	8.7%
3	34.2%	24.9%	12.0%	14.8%	17.7%	19.6%	17.7%	27.8%	15.9%
4	12.2%	22.5%	20.0%	30.7%	27.2%	32.4%	35.5%	23.3%	26.6%
5	10.9%	31.8%	52.8%	32.4%	27.6%	20.8%	20.0%	11.3%	27.4%
No Response	8.7%	8.0%	8.5%	8.7%	9.2%	10.7%	10.7%	10.7%	11.5%
Percent Favorable	23.1%	54.3%	72.8%	63.1%	54.8%	53.2%	55.5%	34.6%	54.0%

Table 3: The percentages of participants who selected each Likert Scale score was determined for all questions. Favorable responses were considered to be any response greater than 3. Percentage of favorable responses were calculated for each question. On average, 50% of participants responded favorably to questions assessing relatedness, 59% of participants responded favorably to questions assessing autonomy, and 47.8% of participants favorably responded to questions assessing competence.

In order to determine whether individual participants’ responses differed significantly between constructs, a paired t-test was conducted. Responses to the autonomy construct questions were found to be significantly higher than both relatedness ( $p < 0.001$ ) and competence ( $p < 0.001$ ). However, there was no significant difference when comparing relatedness to competence ( $p = 0.15$ ).

When comparing results according to participant age, linear regression indicated that responses to relatedness on the Likert Scale decreased by 0.15 points with every

additional ten years of participant age ( $p < 0.001$ ). While the favorability of responses to questions assessing autonomy and competence also decreased with increasing age, the association was not statistically significant ( $p > 0.05$ ).

Linear regression indicated variation in associations between constructs, time since last stay, and cumulative length of stay (Table 4). Greater length of time since last stay was associated with a significant decrease in favorability of responses to relatedness ( $p < 0.05$ ) and competence ( $p = < 0.05$ ). Longer cumulative length of stay favorably impacted responses to questions assessing all constructs ( $p < 0.05$ ). There was no significant relationship between autonomy and time since last stay at GMFR.

<b>Relationships Between Construct Score and Demographic Characteristic</b>			
	<b>Relatedness</b>	<b>Autonomy</b>	<b>Competence</b>
<b>Time Since Last Stay</b>	-0.09	-0.05	-0.15
P-Value	<0.05	0.2	<0.05
<b>Cumulative Length of Stay</b>	0.07	0.11	0.10
P-Value	<0.05	<0.05	<0.05
<b>Age</b>	-0.15	-0.04	-0.03
P-Value	<0.05	0.4	0.4

Table 4: Mean responses to questions assessing relatedness, autonomy, and competence were compared to the demographic characteristics time since last stay, cumulative length of stay, and age using linear regression. The coefficients describing the relationships between each construct score and demographic, and the statistical significance of the associations, are listed.

Discussion:

Data suggest that all SDT constructs are positively impacted to some extent during a participant's stay at GMFR. Autonomy was the most significantly affected, likely because it is a primary focus of the curriculum at GMFR. Specifically, the GMFR curriculum works with clients to transform participant mindset from a focus on

restrictive dieting to a state of mindful, intuitive eating practices involving awareness of internal hunger cues and food-related needs. Ability to remain attuned to these cues in the context of the food environment requires a strong sense of autonomy and understanding of individual needs.

Although there are no recent studies examining whether one SDT construct can be developed more easily than another, the clinical staff of GMFR assert that autonomy can be developed within shorter periods of time than competence, since it takes weeks of practice to master any new behavior. Furthermore, studies by Gourlan, Hartmann, and Teixeira and colleagues found that individuals were more likely to engage in health behaviors, set intrinsically-motivated goals, and continue weight loss programs after returning home when autonomy was enhanced.<sup>4,11,12</sup> For this reason, it is possible that GMFR participants who experienced enhanced autonomy were also able to maintain other health-related behaviors developed at GMFR, such as exercise habits or mindful eating practices.

Competence significantly decreased with increasing duration of time since last stay, but significantly increased with longer stays at GMFR. This suggests that longer periods of formal reinforcement may be required to promote the long-term retention of perceived competence. Research suggests that adults build competence most effectively when provided with opportunities to practice tasks in real-life situations in addition to feedback on their completion of the task.<sup>13</sup> GMFR facilitates the development of eating competence at every meal, serving appealing foods so that participants can practice mindful eating and recognize appropriate portion sizes.

However, nearly 50% of participants stayed at GMFR for two weeks or less, which may not have allowed sufficient time to develop strong eating competence skills. It may be beneficial for GMFR to consider strategies for past participants to continue building

competence after returning home, such as remote counseling, during which GMFR staff can support participants' eating competence strategies.

Relatedness was more effectively increased by longer stays at GMFR. It is therefore likely that extended stays give participants more time and opportunity to build positive interpersonal relationships with other participants at the facility. Continued reinforcement of the relatedness construct may be necessary for participants to retain their perceived relatedness skills so that they can maintain relationships in their home environments. While the literature is lacking in studies on the development of relatedness over time, this may be a potential area of future research for GMFR or other residential facilities. In order to maintain this skill over the long term, it may be beneficial for GMFR to provide strategies for participants to maintain close relationships with each other after returning home. For example, the creation of a social media forum for GMFR past participants would allow women to connect via chatroom or discussion board in order to talk through any challenges they may experience. Additionally, hosting periodic reunions may allow GMFR past participants to reconnect and build additional relationships.

Interestingly, relatedness decreased with longer periods of time since last stay at GMFR. This may be attributed to insufficient access to social networks in the home environment. Specifically, if a participant does not have a supportive social network, she may not continue to experience relatedness upon leaving GMFR. As a residential facility, GMFR promotes the development of supportive relationships among participants. Upon returning home, past participants may not feel that others within their social network understand their unique challenges with food-related behaviors or body image. Additionally, relatedness significantly decreased with increasing age of participation in the survey. Surveys of older adults have documented that size of social networks and closeness to network members decreases with age.<sup>14</sup> It is possible that a

combination of older age and greater time since last stay resulted in a greater decrease in relatedness than either of the two variables would have independently.

Finally, it appeared that with increasing age, the sense of autonomy, competence, and relatedness decreased, with a statistically significant relationship between greater participant age and decreased relatedness. These findings suggest that older participants may require a different approach to build and maintain these skills. To improve outcomes for all ages, GMFR could consider designing cohorts by age, in which participants may experience fewer barriers to connecting and a greater chance to relate to one another.

#### Conclusion:

According to these results, stays of all durations at GMFR positively impacted past participants' perceptions of the SDT constructs studied, suggesting that residential facilities that employ SDT have the potential to beneficially impact recovery from BED through enhancing autonomy, competence, and relatedness. Increased cumulative length of stay positively impacted responses for all three constructs. Specifically, autonomy was most positively rated by survey participants, and maintenance of autonomy did not significantly decrease with age. Research about the optimal time required to most effectively enhance these skills is limited; additional research on this is warranted, and may beneficially add to the body of literature on SDT.

Increasing age was significantly associated with decreased relatedness, and increasing time since last stay was significantly associated with decreased relatedness and competence overall. In order to maximize the GMFR experience for participants of all

ages, further research is warranted to explore mechanisms for improving the relatedness, autonomy, and competence of older GMFR participants.

Limitations:

The primary limitation to this study is lack of generalizability. Since the survey was administered only to GMFR participants, it is impossible to conclude that women with BED who attend other residential facilities or receive non-residential treatment may be similarly impacted. Another limitation relates to the low response rate within the population sampled, furthering to the inability to make generalizations about the larger GMFR population. Had the researchers been approved to send a second invitation to the survey and allowed a longer turnaround time for completion, the number of participants may have increased.

Further, GMFR employs only one of many behavior change theories where other approaches may hold equal promise for improving client health outcomes. Also, baseline perceptions of autonomy, relatedness, and competence were not assessed; thus, there was no basis for meaningful comparison that might help to demonstrate the impact of the GMFR treatment approach for each client on the SDT constructs studied. Finally, some individuals who stayed at GMFR more than five years prior to survey administration discontinued its completion after question #3 due to confusion about the survey language.

References:

1. Schuler J, Kuster M. Binge eating as a consequence of unfulfilled basic needs: The moderating role of implicit achievement motivation. *Motiv Emot.* 2011;35(1):89-97. doi:10.1007/s11031-010-9200-y.
2. Binge Eating Disorder | National Eating Disorders Association. <https://www.nationaleatingdisorders.org/binge-eating-disorder>. Accessed April 5, 2016.

3. Hrbackova K, Suchankova E. Self-determination approach to understanding of motivation in students of helping professions. *Procedia - Soc Behav Sci*. 2016;217:688-696. doi:10.1016/j.sbspro.2016.02.120.
4. Gourlan M, Trouilloud D, Sarrazin P. Motivational characteristics of obese adolescents toward physical activity: Contribution of self-determination theory. *Rev Eur Psychol Appliquée European Rev Appl Psychol*. 2013;63(4):209-218. doi:10.1016/j.erap.2013.02.001.
5. Satter E. Eating competence: definition and evidence for the Satter Eating Competence model. *J Nutr Educ Behav*. 2007;39(5 Suppl):S142-153. doi:10.1016/j.jneb.2007.01.006.
6. Contento IR. *Nutrition Education: Linking Research, Theory, and Practice*. 2nd ed. Sudbury, Massachusetts: Jones and Bartlett Publishers, LLC; 2011.
7. Self-Determination Theory. 2015. <http://www.selfdeterminationtheory.org/theory/>. Accessed June 17, 2015.
8. Verstuyf J, Vansteenkiste M, Soenens B, Boone L, Mouratidis A. Daily ups and downs in women's binge eating symptoms: the role of basic psychological needs, general self-control, and emotional eating. *J Soc Clin Psychol*. 2013;32(3):335-361. doi:10.1521/jscp.2013.32.3.335.
9. Bénabou R, Tirole J. Intrinsic and extrinsic motivation. *Rev Econ Stud*. 2003;70(3):489-520.
10. Custers AFJ, Westerhof GJ, Kuin Y, Gerritsen DL, Riksen-Walraven JM. Relatedness, autonomy, and competence in the caring relationship: The perspective of nursing home residents. *J Aging Stud*. 2012;26(3):319-326. doi:10.1016/j.jaging.2012.02.005.
11. Hartmann C, Dohle S, Siegrist M. A self-determination theory approach to adults' healthy body weight motivation: A longitudinal study focussing on food choices and recreational physical activity. *Psychol Health*. 2015;30(8):924-948. doi:10.1080/08870446.2015.1006223.
12. Teixeira PJ, Silva MN, Mata J, Palmeira AL, Markland D. Motivation, self-determination, and long-term weight control. *Int J Behav Nutr Phys Act*. 2012;9(22).
13. Motivating Adult Learners - Motivational Strategies. <http://userpages.umbc.edu/~koconne/1/605TheAdultLearner/strategies.htm>. Accessed April 19, 2016.

14. Cornwell B, Laumann EO, Schumm LP. The social connectedness of older adults: A national profile. *Am Sociol Rev.* 2008;73(2):185-203.  
doi:10.1177/000312240807300201.