

Metrics for weight management success: an examination of the lifestyle score

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ABSTRACT

Multiple weight loss attempts, and weight regain are common. Various lifestyle changes are often required for success, but just diet and exercise are often promoted. The amount of lifestyle changes needed for successful weight management is still unclear. Lifestyle metrics, such as the Lifestyle Score (LS) of The Lifestyle Questionnaire for Weight Management (LQ-WM), may provide clarification and predict success rates. The range of possible scores on this measure is from -49 to 77 , where higher scores suggest healthier lifestyles. Hypotheses are that higher lifestyle scores will be found with successful weight management outcomes. **Method:** 1,007 online participants completed the LQ-WM and other items related to weight management. **Results:** 90.7% (39/43) of participants with an LS of 50+ reported successful weight loss, while just 5% (2/40) reported weight regain. 35.7% (20/56) of those with LS below zero reported weight loss success, and 39.4% (13/33) reported weight regain. Significant ($p < .001$) mean LS differences existed between those with healthy BMI versus the obese range ($m = 22.2$, $SD = 15.51$; $m = 6.70$, $SD = 15.97$) and those reporting success versus those not reporting success ($m = 26.92$, $SD = 17.03$; $m = 13.68$, $SD = 14.95$). **Discussion and Conclusions:** Future studies should employ more diverse samples and use causal designs. The LS from the LQ-WM may be a helpful tool in research and clinical interactions to raise patients' awareness of behavioral patterns, increase the likelihood of success, and prevent future weight gain.

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1. Introduction

Overweight and obesity contribute to 3.4 million deaths annually worldwide (Smith & Smith, 2016). In the U.S., data from the National Health and Nutrition Examination Survey (2017–2018) indicates that 42.5% of adults have obesity, 9.0% have severe obesity, and 31.1% are overweight (Fryar et al., 2020). However, weight loss remains challenging, with only about 20% achieving success when it is defined as losing 10% of their

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initial weight and maintaining it for a year (Wing & Phelan, 2005). Still, even a 5% weight reduction is considered clinically meaningful (McCafferty et al., 2020). A healthy lifestyle is generally recommended to achieve long-term success in weight management. However, the interpretation of a healthy lifestyle can vary between healthcare providers and patients. Various studies have identified behaviors such as physical activity (Ostendorf et al., 2021), calorie tracking (Dunn et al., 2019), and others associated with weight loss, helping define a healthy lifestyle's components. Nonetheless, it remains unclear what specific level of a healthy lifestyle is necessary for reliable success in weight management.

Recommendations emphasizing physical activity and calorie intake for weight management may not encompass a sufficient range of behaviors to promote a sustainable and healthy lifestyle. However, measures of a healthy lifestyle that integrate a range of weight-related behaviors would be valuable for promoting success. The current study evaluates the Lifestyle Score (LS) metric from The Lifestyle Questionnaire for Weight Management (LQ-WM) (Anderson & Hammond, 2018). A lifestyle metric can enable clinicians to educate patients about their patterns and likelihood of success, offering more tailored and specific recommendations for behavior change compared to current approaches.

1.1. Lifestyle recommendations

The American College of Sports Medicine recommends more than 250 min of weekly physical activity to enhance weight loss maintenance (Donnelly et al., 2009). However, such guidelines can discourage individuals with lower exercise motivation. Moreover, solely focusing on exercise quantity may not reliably predict success in weight management if other behaviors are neglected. Additionally, while exploring the connection between physical activity and the rising rates of obesity over recent decades, some research did not establish a direct link between a steady decline in energy expenditure and obesity (Wiklund, 2016). As a result, the US Preventive Services Task Force advocates for intensive, multicomponent behavioral interventions aiming for a 5% reduction in body weight (Moyer, 2012). Nonetheless, these interventions often necessitate more than a dozen sessions in the first year, which may not align with many individuals' lifestyles.

Recommendations to restrict calories often include creating a daily deficit of 500–1,000 calories to produce 1–2 lbs. weight reduction weekly (National Institutes of Health, 2023). A limitation of this recommendation is that it focuses on calorie restriction without addressing other behaviors associated with long-term weight management success. Overly focusing on one behavior may provide an incomplete picture of the changes necessary for success. Indeed, some argue that the dietary management of obesity should involve recognizing complex biopsychosocial systems and individual differences (Hwalla & Jaafar, 2021)

Understanding the need for behavioral interventions to be multi-dimensional, the U.S. Preventive Screening Task Force recommended behaviors such as goal setting, increased addressing barriers to change, self-monitoring, and planning for maintenance of gains (Moyer, 2012). The National Weight Control Registry tracked 2,886 individuals who had lost at least 30 lbs. and kept it off for at least one year throughout ten years of monitoring. Studies of these individuals have shown that 60 min of daily exercise, frequent self-weighing, regular breakfast consumption, and consistent eating patterns

were characteristic of long-term success, while decreases in self-weighing and leisure-time physical activity were associated with weight regain (Bond et al., 2008; McGuire et al., 1999; Thomas et al., 2014). Behaviors such as television viewing (Giles-Corti et al., 2003), disinhibition and binge-eating (McGuire et al., 1999; Thomas et al., 2014), and levels of depression (Bond et al., 2008) have also been found to be associated with weight gain. Given these associations, such factors should be considered in a comprehensive lifestyle plan. Such comprehensive interventions tend to result in a loss of approximately 10% of initial weight in 4–6 months, which is associated with decreased hypertension and type 2 diabetes (Wadden et al., 2007).

Taxonomies of behavior change techniques have been developed. For example, The Behavior Change Technique Taxonomy (v1) (Michie et al., 2013) contains 93 hierarchically clustered techniques – illustrating the complexity of lifestyle factors. A single lifestyle measure incorporating multiple components could simplify the process for individuals and provide direction for researchers.

Although counseling may promote multiple behavioral changes, providers often do not engage in such counseling due to time restraints and a lack of comfort with counseling (Kraschnewski et al., 2013). Consequently, an instrument was developed to facilitate brief yet effective weight management counseling sessions. The Lifestyle Questionnaire for Weight Management (LQ-WM; described in more detail later) is a self-report measure of various behaviors associated with weight management. The composite score was previously found to significantly associate with self-reported weight management success (Anderson & Hammond, 2018). Consequently, the LQ-WM provides a single measure of a healthy lifestyle and can identify warning signs of future weight gain. The pilot study revealed a connection between LS and weight loss success, highlighting 11 participants with LS above 50 who were all successful. The present study tested an updated LS by removing a non-weight management-related item from the pilot questionnaire. Moreover, the current study features a sample size nearly twice that of the pilot study, incorporating 43 participants with an LS of 50 or higher. This larger analysis of these scores will allow a broader exploration of potential cutoffs for reliable weight loss success. Cut-off scores for reliably avoiding weight regain would also be beneficial and may be lower than cut-offs for weight loss. Consequently, three main groups of hypotheses will be tested.

Hypothesis 1: The LS will trend upwards for successful categorical outcomes in weight management. An exploratory analysis will examine potential cut-off scores.

Hypothesis 2: Lower ranges of the LS will show higher percentages of obesity status, weight gain, and weight regain.

Hypothesis 3: Significant mean differences in the LS will exist between weight management groups.

2. Materials and methods

2.1. Participants and procedure

Participants included 1,007 individuals over the age of 18 who followed an online link to a Qualtrics survey regarding weight management. All participants provided informed

consent. College students, mainly from Psychology classes representing multiple majors, were initially recruited for the study. These students were offered extra credit for posting the survey link on social media to expand the sample size and reach more diverse participants. This research protocol was approved by the Institutional Review Board at Utah Valley University and assigned tracking number 01565.

2.2. Measures

2.2.1. Healthy lifestyle

The Lifestyle Questionnaire for Weight Management (LQ – WM; see Appendix B) was used to estimate the number of healthy behaviors in participants' lifestyles. The LQ-WM comprises 18 items in which individuals report how many days in a typical week they engage in various healthy and unhealthy weight-related behaviors such as tracking calories, physical activity, consuming unhealthy foods, binge eating, etc. The LQ-WM also contains three items regarding their motivational levels for behavior change and how their body image impacts their self-esteem. The LQ-WM includes a Motivational Interviewing framework and was created for clinical settings to facilitate brief yet effective weight management counseling sessions. The LQ-WM also yields a single *Lifestyle Score (LS)* to summarize how healthy someone's lifestyle is and estimate their probability of weight management success. A higher score represents a healthier lifestyle. The range of possible scores is from –49 to +77. The LS is computed by summing the total days in a typical week that a healthy behavior is completed and subtracted by the frequency of unhealthy behaviors as shown below:

(Reading food labels + track calories + keep a calorie goal + adequate sleep + 30 min of exercise + take 10,000 steps + find opportunities for physical activity + modify meals in a healthy way + drink 4 cups of water or more + check weight + plan meals) – (binge eating – purging – 2 > hours of screen time + felt guilt/shame about eating – consume drinks with calories – consume fast food – eat due to boredom/stress) = Lifestyle Score

After calculating participants' Lifestyle Scores, they were coded into one of several *Lifestyle Score groups* ranging from scores below zero, 0–9; 10–19; 20–29; 30–39; 40–49; 50–59; and 60+. These ranges were selected because Lifestyle Scores generally followed a normal distribution, and it is practical for providers and patients to remember ranges beginning with every tenth number.

The statistical properties of the LQ-WM were pilot-tested amongst college students, and the assumption that higher Lifestyle Scores trended with weight loss success cross-sectionally was supported (Anderson & Hammond, 2018).

2.2.2. Weight management outcomes

Various possible outcomes in weight management were obtained from self-reported patterns and history on a general weight history questionnaire (See appendix C). *Successful Weight Management* was determined by participants' binary response to the item: *Have you found a weight management approach that works well for you? Yes/no.*

Recent weight loss and gain were determined by participants' responses to the item: *Recently it seems as though I've been: gaining, maintaining, or losing weight.*

Continued Success in weight management was defined as participants who had lost at least 5% of their initial body weight and reported recently maintaining or losing weight. A 5% reduction in body weight was chosen since it has been associated with various health benefits (McCafferty et al., 2020).

Participants in the *weight regain group* were those who reported having lost at least one lb. initially in their weight loss attempt but reported recent weight gain. Further, the BMI Group analyses in Table 3 examined the LS of individuals not currently engaged in a weight loss attempt. This was done because individuals may engage in higher amounts of healthy behaviors during weight loss, and the desire was to assess 'baseline lifestyles' when individuals are not trying to lose weight.

2.2.3. Data analysis

Tests of normality and homoscedasticity were conducted to determine the appropriateness of the tests. Given the large sample size, graphical tests of a normal distribution for the LS were conducted. A histogram showed non-significant skew and kurtosis, and a Q-Q Plot showed that scores were largely in line with an expected normal distribution. The homogeneity of variance between groups was assessed with Levene's test. *P* values for independent samples t-tests were reported on whether the variance between groups was equal or unequal. For One-Way ANOVA tests, the *p*-value from a Brown-Forsyth test was reported whenever there was unequal variance between groups.

Hypothesis 1 was tested with Chi-square tests to determine if a higher LS trended with higher percentages of successful weight management. A cut-off LS of 50 was also explored for the percentage that it corresponded to successful weight management. Hypothesis 2 was tested with Chi-square tests to determine if lower LS ranges would coincide with higher percentages of weight gain. Lifestyle scores above 30 were also explored to assess patterns of weight regain. Hypothesis 3 was tested with independent samples t-tests and One-Way ANOVAs to determine if significant mean differences existed between dimensions of weight management success. Demographic differences with the LS were explored via One-way ANOVAs and independent samples t-tests.

3. Results

Most participants reported their education level as having some college or a two-year degree. 35.5% reported having at least a bachelor's degree. Participants were predominantly Caucasian (91.5%) and female (76.4%). See Appendix A for more demographic information.

For hypothesis 1, after separating participants by Lifestyle Score ranges, Chi-Square tests for categorical data assessed the relationships between Lifestyle Score groups and groups reporting Successful Weight Loss, their recent weight trajectory, and whether they achieved significant weight loss. Overall, a significant association existed between the Lifestyle Score range and reporting successful weight loss, recent weight loss, and level of weight loss. Of those who reported Lifestyle Scores of at least 50, 90.7% (39/43) reported having a successful weight loss approach, 62.8% reported recent weight loss, and 92.3% were identified as having continued weight management success. Interestingly, 100% of participants (11/11 participants) with Lifestyle Scores above 60 reported having found a successful weight loss approach, current weight loss, and continued

Table 1. Hypothesis 1: LS and success chi-square tests for categorical data.

Group Lifestyle Score Ranges	Successful Weight Loss***			Currently Losing Weight***			Continued Success***		
	# Successful	Total	%	# Successful	Total	%	# Successful	Total	%
> 0	20	56	36	5	56	9	6	19	32
0–9	26	69	38	6	70	18	7	21	33
10–19	39	100	39	10	100	10	21	35	60
20–29	66	116	57	21	116	18	31	45	69
30–39	66	88	75	29	88	33	31	38	82
40–49	44	56	79	24	56	43	26	31	84
50–59	28	32	88	16	32	50	16	18	89
60–69	11	11	100	11	11	100	8	8	100
Total	300	528	57	122	529	23	146	215	68

Note: *** indicates $p < .001$.

success in weight management (8/8 participants). However, the sample size for such high scores was low, as just 1% of the sample had an LS above 60. (Table 1)

The 2nd hypothesis proposed a negative trend between the LS and weight gain (see Table 2). Overall, Lifestyle Score ranges were significantly and negatively associated with obesity status, current weight gain, and weight regain. Notably, 54.1% of those with scores below zero were in the obese or extreme obesity ranges; 42.1% reported current weight gain, and 39.4% reported weight regain following weight loss. Consequently, Lifestyle Scores below zero may represent a high-risk score for negative health outcomes. Conversely, just 3.2% of those with scores 30 and above reported obesity or extreme obesity, 6.2% reported recent weight gain, and 8.3% reported weight regain. Therefore, scores of 30 + may be recommended as protective against negative health consequences. Also, despite a small sample size, 0/5 participants with scores 60 + had obese/extreme obesity or reported recent weight gain, and 0/11 reported weight regain.

The third hypothesis proposed there are mean differences between weight management groups, which is summarized in Table 3. Notable mean differences in Lifestyle Scores were observed between participants with healthy BMI levels compared to levels in the Obese range ($m = 22.22$ and $m = 6.7$, respectively. $p < .001$) who were not currently engaged in a weight loss attempt. Significant mean differences in Lifestyle Scores were also observed between participants reporting recent weight loss and weight gain ($m = 32.33$ and $m = 12.98$, respectively. $p < .001$), those reporting having a successful

Table 2. Hypothesis 2: LS and weight gain chi-square tests for categorical data.

Group Lifestyle Score Ranges	Obese or Extreme Obesity***			Recently Gaining Weight***			Weight Re-gain***		
	# Obese	Total	%	# Gaining	Total	%	# Re-gaining	Total	%
> 0	20	37	54.1	16	38	42.1	13	33	39.4
0–9	13	65	20.0	13	66	19.7	14	41	34.1
10–19	11	82	13.4	17	88	19.3	14	67	20.9
20–29	10	91	11.0	17	96	17.7	14	86	16.3
30–39	1	54	1.9	2	56	3.6	7	76	9.2
40–49	0	22	0.0	4	24	16.7	5	53	9.4
50–59	2	12	1.7	2	12	16.7	2	29	6.9
60–69	0	5	0.0	0	5	0.0	0	11	0.0
	57	368	15.5	71	385		69	396	

Note: *The weight regain category comprised individuals who had reported initial weight loss but reported recent weight gain.

Table 3. Hypothesis 3: LS group comparisons.

Group	<i>N</i>	Mean	<i>SD</i>	<i>p</i>
Underweight	17	27.50	12.00	<.001*
Healthy Weight	190	22.22	15.51	
Overweight	57	17.71	16.85	
Obese	42	6.71	15.97	
Extreme Obesity	19	5.76	13.99	
Total	341	18.86	16.69	
<i>Mean Lifestyle Scores Between Recent Weight Trajectory</i>				
Weight loss	161	32.33	19.01	<.001
Weight Maintenance	543	21.50	15.52	
Weight Gain	210	12.98	16.30	
Total	914	21.45	17.45	
<i>Mean Lifestyle Scores Between Weight Management Success and No Success</i>				
No Success	375	13.68	14.95	<.001
Success	537	26.92	17.03	
Total	912	21.45		
<i>Mean Lifestyle Scores of Continued Success or Weight Regain**</i>				
Weight Regain	69	15.20	17.49	<.001
Continued Success	146	32.13	17.04	
Total	215	26.70	18.88	

Note: **t*-tests did not reveal significant differences between underweight, healthy weight, and overweight participants. A *t*-test between obese and extreme obesity was $p = .05$.

** Continued Weight Management Success was determined by participants having lost at least 5% of their initial body weight and a report of weight maintenance or continued weight loss. The weight regain group was determined as participants who reported previous weight loss but have reported recent weight gain.

weight management strategy, and those who do not ($m = 26.92$ and $m = 13.68$, $p < .001$), and those maintaining weight loss versus those who are regaining lost weight ($m = 32.13$ and $m = 15.20$, $p < .001$).

Lastly, exploratory analyses of lifestyle scores based on demographic factors were considered. Men and women did not have significant differences with lifestyle scores ($m = 21.0$ and 21.6 , $p = .67$). Lifestyle scores between those 18–24, 25–39, and 40+ were also not significantly different ($m = 21.0$, 21.4 , and 22.9 , $p = .50$). The sample was predominantly White but significant differences between participants of White and other racial backgrounds was not found in lifestyle scores ($m = 21.7$ and 18.7 , $p = .17$). Holding an advanced degree was associated with a higher lifestyle score compared to participants with two or 4-year degrees, or less formal education ($m = 24.5$, 22.2 , and 19.8 , $p = .04$).

4. Discussion

In the present study, selected samples were drawn from a sample of 1,007 participants to assess the association between Lifestyle Scores from the Lifestyle Questionnaire for Weight Management (LQ-WM) and various dimensions of weight management success and difficulties. Lifestyle Scores trended with self-reported successful weight management, recent weight loss, BMI group, and weight regain. This study also followed up on a previous study, which found Lifestyle Scores of 50+ to strongly trend with success. Similarly, Lifestyle Scores 50+ trended with several dimensions of weight loss success, such as reporting having a successful weight management system, recent weight loss, and keeping off weight after losing it. Interestingly, Lifestyle Scores of 60+ were less frequent but highly coincided with reporting a successful weight management system, recent weight loss, and keeping off weight after losing it. Conversely, Lifestyle

Scores below zero trended with not reporting a successful weight loss strategy, recent weight gain, and weight regain. Scores of 30 + trended with avoiding weight regain. This study suggests that Lifestyle Scores trend higher percentages of several dimensions of self-reported success in weight management, which could interest patients and clinicians and invite further research.

Since previous investigations of those successful in weight loss have found multiple behavioral changes to be important (Bond et al., 2008; Giles-Corti et al., 2003; McGuire et al., 1999; Thomas et al., 2014), the LQ-WM can bring various lifestyle changes to patients' awareness. Additionally, those trying to lose weight may respond more favorably to various behavior change options besides increased exercise or caloric restriction. The LS can also provide context to the patient regarding their likelihood of success, given their current patterns.

If Lifestyle Scores in the 50 + range, and especially the 60 + range, continue to reliably trend with weight loss success, such a specific numeric recommendation may decrease a sense of learned helplessness in patients who feel it is impossible for them to achieve success. Future studies can further establish reliability in lifestyle metrics, such as the LS, and address limitations in the present study. For example, an analysis of the impact of separate behaviors was beyond the scope of this study but could shed light on which behaviors are most important. Since the current study utilized self-reporting of various dimensions of weight management success and behavioral reporting, future studies could employ more objective designs to track weight management success and behavioral tracking. For example, studies that collect data through validated smart devices such as scales and fitness watches could be compared to self-reported behaviors. Employing more validated measures of weight loss could also be used for sensitivity and specificity estimates for lifestyle metrics. The LS could also be compared to other composite lifestyle measures, such as Life's Essential 8 from The American Heart Association (Lloyd-Jones et al., 2022). An advantage the LS could offer patients is that it provides feedback about how the score compares to those who have reached success with weight management. The LS could also be compared against a single behavior longitudinally to establish the predictive power of composite measures over single behaviors. A factor analysis could examine the LQ-WM's structure and if any items could be removed.

Participants in this study tended to be more young, female, and higher educated than the general population. However, within this sample, significant differences in lifestyle scores were not found between men and women, young, middle, and older-aged adults, or between participants of White or other racial backgrounds. However, higher education levels were associated with higher Lifestyle Scores. Consequently, the generalizability of the findings should be investigated in other populations and cultures. Also, modified lifestyle tracking measures could be developed for cultures with different weight management factors. Moreover, the present study was cross-sectional; therefore, an important issue is the directionality of whether high lifestyle scores caused weight management success or were merely associated with it. Consequently, experimental or longitudinal designs would be valuable in addressing causality. Additional research can also use qualitative techniques to explore patients' experiences when attempting to increase Lifestyle Scores. Digital service providers could use research from lifestyle metrics to design apps and devices that deliver helpful feedback to users. Since this study examined LS differences between BMI groups, the statement from the American

Medical Association about the limitations of the BMI is worth noting. Namely, that BMI correlates with fat mass in the general public but loses predictability when applied to individuals (Tanne, 2023).

Notwithstanding the association between lifestyle scores of 50+ and success, it is important to remember that the more ambitious the lifestyle changes are, the less likely an individual may be to sustain them. Also, a score of 50+ is not necessary for everyone, as many participants in the current study reported weight management success with lower scores.

5. Conclusions

A healthy lifestyle through multiple behavioral changes is recommended for long-term success in weight management. Specific amounts of healthy lifestyle have not been well established, but lifestyle metrics may be useful in that regard. This study followed up on the utility of the Lifestyle Score (LS) from a pilot study of the Lifestyle Questionnaire for Weight Management. Overall, the LS trended with self-reported weight management success, recent weight loss, avoiding weight regain, and obesity status – especially in higher dosages of healthy lifestyle. Indeed, over 90% of individuals with an LS of 50+ reported success with weight management. The LS and other lifestyle metrics may also be helpful clinical tools to raise patients' awareness of their weight patterns compared to individuals who have successfully managed weight. Lifestyle metrics could also warn of future weight gain in currently healthy weight individuals. The LS can also play a role in research to quantify healthy lifestyles. Future research is needed to test the LS as a reliable metric for weight management success in different settings and populations since education level was the only demographic in this sample that showed statistical significance. Lifestyle metrics, such as the LS, may broaden the ability of researchers and health practitioners to support patients' success in a relatively inexpensive and broad-reaching modality.

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Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The dataset used in this study is available for reasonable purposes through correspondence with the first author.

Ethics statement

The study was conducted in accordance with the Declaration of Helsinki and was approved by an Institutional Review Board. See details under Methods.

Informed consent

All participants provided informed consent prior to participation. They were provided with details about the nature of the study and that they were free to stop participating at any time for any reason without negative consequences.

Author's contributions

CA and RH designed the questions for participants. CA performed the statistical analysis. LW assisted with the literature review and proofreading. All authors approved the final manuscript.

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