**A R T I C L E**

# Hope and behavioural weight loss: Pathways lead to greater weight loss than agency or goals

**Austin R. Medlin**[1,2] 🔘 | **Kelsey L. Sinclair**[1,2] | **Misty A. W. Hawkins**[2]

[1]Department of Applied Health Sciences, Indiana University School of Public Health, Bloomington, Indiana, USA

[2]Department of Health & Wellness Design, Indiana University School of Public Health, Bloomington, Indiana, USA

**Correspondence**

Misty A. W. Hawkins, Department of Health & Wellness Design, Indiana University School of Public Health, Bloomington, IN 47405, USA. Email: miahawki@iu.edu

## Abstract

**Background:** Hope is a motivational state comprised of agency (internal drive), pathways (perceived external means), and goals (future targets) that may predict weight loss, but evidence is limited. This study examined hope and its sub-scales (agency, pathways, goals) as predictors of weight loss in a behavioural treatment.

**Method:** Adults ($n = 107$) with body mass index (BMI) $\geq 27$ participated in a 6-month weight loss program with 12-month follow-up. Hope and its subscales were assessed at baseline using the Adult Hope Scale-Revised (HSR-2). Percent weight lost (%WL) was calculated for post-treatment ($n = 70$) and follow-up ($n = 61$). Covariates included positive affect, gratitude, optimism, age, sex, education, BMI, and adverse childhood experiences. Linear regressions tested the relationship between HSR-2 total and subscales with %WL at post-treatment and follow-up, adjusting for covariates. Complete case and intention-to-treat analyses with multiply imputed data were conducted.

**Results:** Complete case analyses showed HSR-2 total scores predicted greater %WL ($\beta = .16$, $p = .001$ post-treatment; $\beta = .29$, $p = .003$ follow-up). This effect was driven by pathways ($\beta = .63$, $p = .001$ post-treatment; $\beta = 1.02$, $p < .001$ follow-up), with agency and goals unrelated to %WL ($p s \geq .353$). Gratitude inversely related to %WL ($\beta = -.82$, $p = .001$ post-treatment; $\beta = -.78$, $p = .020$ follow-up). Among the intention-to-treat sample, HSR-2 total trended towards follow-up %WL ($\beta = .14$, $p = .062$); pathways predicted at both timepoints ($\beta = .32$, $p = .047$ post-treatment; $\beta = .59$, $p = .001$ follow-up).

**Conclusion:** Higher pathways thinking, a component of hope, predicted clinically significant weight loss and weight

maintenance. Lower gratitude may predict weight loss (among completers), suggesting dissatisfaction with one's current state, combined with a belief in pathways to a better future, drove greater weight loss.

**KEYWORDS**
gratitude, hope, obesity, positive psychology, weight loss

**Statement of contribution**

**What is already known on this subject?**

- Positive psychology variables are associated with physical and mental health outcomes.
- Hope, the most heavily researched positive psychology variable, is related to weight loss.
- The relationship between weight loss and hope's subscales agency, pathways, and goals is nuanced.

**What does this study add?**

- Assessment of hope's overall relationship with weight loss in a behavioural weight loss trial.
- The differential relationships between agency, pathways, and goals for weight loss.
- How hope and its subscales relate to retained weight loss following completion of the trial.

# INTRODUCTION

Positive psychology is the study of flourishing for ideal human functioning and the processes that contribute to these conditions (Gable & Haidt, 2005) and is part of a global movement towards the science of well-being (Hendriks et al., 2019). Research in this field has shown positive psychological variables to be associated with various health outcomes such as physical and mental well-being (Gallagher et al., 2021; Long et al., 2020; Murphy, 2023). More specifically, increased positive psychological experiences are related to reduced inflammatory biomarkers (Zuccarella-Hackl et al., 2023), lower cardiovascular disease risk (Boehm et al., 2011; Boehm & Kubzansky, 2012), and improved pulmonary function (Kubzansky et al., 2002), as well as improved feelings of pain intensity for those with chronic pain (Müller et al., 2016) and decreased depressive symptoms in clinical populations (Bolier et al., 2013; Sin & Lyubomirsky, 2009). Some common positive psychology and well-being variables and processes include positive affect (Schiffrin, 2014), gratitude (Cunha et al., 2019), optimism (Campbell & Løkken, 2022), and hope (Snyder et al., 2021; Shorey & Snyder, 2004). The present study focuses especially on hope – one of the most studied positive psychological variables with strong empirical and theoretical foundations – and its relationship to the health behaviour of weight loss in a population with overweight or obesity.

Hope is an independent protective factor in key health outcomes, including reduced risk of all-cause mortality (Long et al., 2020). The Hope Theory posits all human behaviour is driven by one's goals, and attainment of these goals are driven by agency and pathways (Rand & Kaitlin, 2021). Agency is defined as the feelings, perceptions, and beliefs that motivate an individual internally to meet their goals while pathways consist of an individual's perception they have the external means needed to reach their goals. More generally, agency pulls from within an individual while pathways are informed by one's perceptions of the barriers and facilitators of their success. Hope Theory and the affiliated Adult Hope

Scale (AHS) have found international reach. This global application has occurred not only because goal-setting behaviours, pathways, and agentic thinking can be widely theoretically applied to an individual's perspectives within their culture of origin – but also because the AHS and its subscales have been psychometrically tested in multiple populations across the world (Martos et al., 2014; Nel & Boshoff, 2014; Nooripour et al., 2022; Sum et al., 2023).

Although hope is comprised of both internal and external perceptions of achieving one's goals, society at large tends to focus significantly more on agency-related constructs in relation to health behaviours, especially in the case of obesity and weight loss (Grannell et al., 2021; Hilbert et al., 2008; Pearl & Lebowitz, 2014). Agency is closely related to the constructs of 'willpower', 'internal drive', or 'motivation'. Obesity stigma literature confirms society often views individuals living in larger bodies as having deficits in motivation, willpower, or agency (Grannell et al., 2021). Such beliefs might suggest the global rise in obesity prevalence is because people chose to live with obesity. This harmful narrative ignores the complex causal models of obesity (Heindel et al., 2024) that attempt to explain a worldwide prevalence of obesity that has nearly tripled since 1975 (Boutari & Mantzoros, 2022). Indeed, an estimated 60%–74% of citizens in the areas of Europe and America are overweight or obese, and the United States of America and Russia presently have the most residents living with obesity (Boutari & Mantzoros, 2022). Current obesity etiological models cite environmental chemical exposure, altered metabolic and hormonal signalling, and energy imbalance secondary to dietary and sedentary behaviours as primary drivers of obesity (Amato et al., 2021; Heindel et al., 2024; Mazza et al., 2024; Schwartz et al., 2017; Wen et al., 2022). What is known about the role of hope in navigating these influences to achieve a healthy lifestyle? Unfortunately, despite lay beliefs in poorer agency among individuals with obesity, empirical investigations of hope and/or its subcategories in relation to behavioural weight loss or related diet or physical activity interventions are quite limited.

Past studies assessing hope and its association with self-reported diet, physical activity, and body mass index (BMI) have shown promise, though. Higher total hope score, agency, and pathways were all associated with increased self-monitoring and social interaction behaviours for diet and physical activity, but only total hope score and agency were associated with self-reported diet planning, preparing, or portion control among adults with obesity (Nothwehr et al., 2013). Higher total hope scores were also found to be associated with increased rates of self-reported physical activity in children (Van Allen & Steele, 2012) and young adults (Berg et al., 2011) as well as lower self-reported BMI in women (Kelsey et al., 2011). While these previous findings are insightful, they are all based on self-reported health behaviours or BMI. The relationship between hope and objectively measured weight loss during behavioural interventions, as well as the unique role(s) of hope's less studied subcategories (i.e., pathways and goals), warrant further investigation. As such, the present study aims to address this gap. We hypothesized:

1. Higher level of the hope total score at baseline will predict greater weight loss at post-treatment and follow-up in a behavioural weight loss trial.
2. The subcategories agency and pathways would both predict weight loss.

Delineating potential relationships of hope and its subscales with weight loss among individuals with overweight and obesity could be crucial in the quest to better understand how positive psychosocial factors inform habits and behaviours which lead to healthy behaviour change.

# METHOD

The present secondary analysis utilized data from the Cognitive and Self-regulatory Mechanisms of Obesity Study – or COSMOS – (ClinicalTrials.gov Identifier: NCT02786238). This parent study was a multi-cohort pilot behavioural weight loss trial exploring potential cognitive and self-regulatory mechanisms of behavioural weight loss for individuals with overweight/obesity. The active behavioural

weight loss treatment lasted for 6 months, with follow-up occurring 6 months later, 12 months after trial initiation. A protocol paper is available for more specific details regarding the protocol of the parent study (Hawkins et al., 2018).

## Participants

Study participants were adults with overweight/obesity recruited from a regional southcentral university and surrounding community. Refer to the protocol paper for detailed descriptions of inclusion criteria. Broadly, participants were eligible if they were between 21 and 65 years of age, spoke English, had a BMI between 27.0 and 52.0, and were free of any major mental or physical health conditions (e.g., substance use, cancer, etc.). A total of 107 participants initiated the trial ($N_{t=0} = 107$), with 70 completing the post-treatment portion of the study at 6 months ($N_{t=6} = 70$) and 61 completing the 12-month follow-up ($N_{t=12} = 61$).

## Measures

### Assessment of hope

*Adult Hope Scale (HSR-2; Shorey & Snyder, 2004)*
This 18-item scale is a foundational measure in the field and measures Synder's cognitive model of hope, which defines hope as 'a positive motivational state that is based on an interactively derived sense of successful (a) agency (goal-directed energy), and (b) pathways (planning to meet goals)' (Snyder et al., 1991). Thus, a respondent's level of hope can be separated into three distinct subcategories – agency, pathways, and goals. Of the 18 items in the scale, six are allocated to each of the three subcategories. All items were asked on an 8-point Likert-like scale with ranges of '1 - Definitely False' to '8 - Definitely True.' A simple summation of question responses was used for scoring with each subcategory range being 6–48 and the total hope score range being 18–144. Higher total scores were associated with higher levels of hope with increased subcategory scores related to elevated levels of the respective domain. A sample agency item is: 'I have what it takes to get the job done'. For pathways, a sample item is: 'I create alternate plans when blocked'. For goals, a sample item is: 'I have many goals I am pursuing'. Internal consistency was calculated at $\alpha = .89$ for the hope total scale, $\alpha = .74$ for the subscale agency, $\alpha = .77$ for pathways, and $\alpha = .77$ for goals, all of which were in line with previous literature (Clement et al., 2020).

### Assessment of positive psychological covariates

Additional positive psychological variables were assessed to adjust for the unique relationship between hope and weight loss after accounting for other related constructs, including positive affect, gratitude, and optimism.

*Positive and Negative Affect Schedule (PANAS-SF; Thompson, 2007)*
The PANAS-SF is a 20-item survey examining various moods and emotions. The survey lists 20 single-word emotions and participants rate on a 5-point Likert-style scale (from '1—Very slightly or not at all' to '5—Extremely') to what extent the participant has felt each emotion in the previous week. The survey can be broken into two sections with 10 items capturing positive affect while the other 10 focus on negative affect. As this study focuses on positive psychology variables, only the positive affect subscale was used for analyses. Positive affect scores can range from 10 to 50, with higher scores reflecting higher levels of positive affect. Internal consistency was $\alpha = .91$.

*Gratitude Questionnaire – Six-Item Form (GQ-6; McCullough et al., 2002)*
The GQ-6 is a six-item survey which asks participants to rate on a scale of 1–7 (from 'Strongly Disagree' to 'Strongly Agree') how much they agree with each statement. The survey aims to assess how likely an individual is to experience gratitude in their life. This item scoring ranges from 6 to 42, with higher scores reflecting higher levels of gratitude. Internal consistency was $\alpha = .84$.

*Life-Orientation Test-Revised Optimism Scale (LOT-R; Scheier et al., 1994)*
The LOT-R is a 10-item scale which captures an individual's perceptions and expectations for positive future outcomes. Each of the 10 items is scored on a 5-point Likert scale, with four of the items being used as filler. Possible scores on this survey range from 0 to 24, with higher scores correlating to higher levels of optimism. Internal consistency was $\alpha = .91$.

## Assessment of behavioural weight loss

*Percent weight loss*
The outcome of interest in this study was percent weight loss (%WL) from baseline to post-treatment ($t = 0$ to $t = 6$) and baseline to follow-up ($t = 0$ to $t = 12$). A research-grade bioelectrical impedance analysis scale (Model TBF 310GS; Tanita Corporation: Arlington Heights, IL USA) was used in-laboratory to objectively measure participant weights at each timepoint. Clinically significant weight loss was defined as $\geq 5\%$ (Douketis et al., 2005; Hamman et al., 2006; Horn et al., 2022; Jensen et al., 2014; Unick et al., 2011). The following formula was then used to calculate %WL:

$$\% \mathrm{WL}_{t=i} = \left[ \frac{\mathrm{Weight}_{t=0} - \mathrm{Weight}_{t=i}}{\mathrm{Weight}_{t=0}} \right] \times 100$$

## Demographic and early life stress covariates

Age, sex, and highest level of education were used as demographic covariates. Also, baseline BMI was used as an anthropometric covariate, while adverse childhood experiences (ACEs) were used as a psychosocial covariate (Felitti et al., 1998).

## Data analysis

Baseline descriptives and demographic data were calculated among those who completed the post-treatment ($N = 70$) and follow-up ($N = 61$). For illustrative and descriptive purposes, participants were grouped by lowest and highest quartiles based on their total hope (HSR-2) and pathways subscale scores, and their patterns of %WL were calculated. A series of linear regressions were then conducted using complete case analyses with %WL at post-treatment (6 months) and follow-up (12-months) as the outcomes of interest, respectively. First, linear regressions assessed the relationship between %WL and positive psychology variables after accounting for all covariates. In this first series of linear regressions, the total hope score was used. Next, the same linear regressions were performed, but hope was split into its three subscales of agency, pathways, and goals to assess any potential relationships unique to individual subcategories. Due to sample attrition from baseline to post-treatment (34.6%) and follow-up (43.0%), we also conducted multiple imputations to account for sample missingness. Following previous literature suggesting one imputation per 1% of missingness is appropriate for accurate estimations (White et al., 2011), a total of 43 imputations composed our analytic sample. A secondary set of analyses following the procedure above was conducted with the multiply imputed dataset, representing our intention-to-treat sample (McCoy, 2017). That is, linear regressions utilizing hope in both its unified form and subcategories were conducted to assess relationships on post-treatment and follow-up weight loss among the imputed sample after accounting for covariates.

SAS 9.4 software (SAS Institute, Inc., Cary, NC) was utilized for all analyses, with a significance cut-off value of $\alpha = .05$ and unstandardized $\beta$'s as the regression factors of interest.

# RESULTS

## Participant demographics

Participants were predominantly white, middle-aged females when starting the weight loss trial, and most had earned at least a bachelor's degree (see Table 1). In general, the complete case sample on average saw a 7.65% decrease in weight from baseline to post-treatment, and a 5.48% decrease in weight from baseline to follow-up. When assessing positive psychology variables, the average sample score in all domains was above its respective median possible scores. Specifically, the average baseline total hope score was 108.36 for post-treatment completers and 109.08 for follow-up completers. The average subcategory scores for agency, pathways, and goals were 37.31, 36.94, and 34.10 for post-treatment participants, respectively. Similarly, average subcategory scores for agency, pathways, and goals were 37.70, 36.97, and 34.41 for those completing follow-up, respectively. See Table 1 for additional participant descriptive statistics and demographic data. Table 1 also provides demographics for the imputed analytic sample.

The %WL results for participants in the highest and lowest quartiles are presented in Figure 1. Baseline BMI was not significantly different between those in the highest ($M = 35.04 \pm 5.33$) versus lowest ($M = 34.86 \pm 5.31$) total hope quartiles or for the pathways highest ($M = 36.24 \pm 5.11$) and lowest ($M = 35.49 \pm 5.70$) quartiles ($ps \geq .600$). At post-treatment, individuals with the highest total hope lost ~1% more weight than those with the lowest total hope, while those with the highest pathways lost over 2% more weight than their lowest pathways counterparts. At follow-up, those with the highest total hope maintained over 2.6%WL compared with those with the lowest hope scores, and highest pathways scorers maintained nearly 2× the %WL than those in the lowest quartile (9.00%–4.62%, respectively; see Figure 1).

## Complete case total hope score & weight loss

When analysing factors potentially related to percent weight loss at post-treatment, total hope score was associated with increased %WL ($\beta = .16$, $p = .014$) after accounting for all covariates. This trend continued at the 12-month follow-up where total hope score again related to increased %WL ($\beta = .29$, $p = .003$).

Of the additional positive psychology variables included for analysis, gratitude was negatively associated with %WL ($\beta = -.82$, $p = .001$), and this trend remained significant at the 12-month follow-up ($\beta = -.78$, $p = .020$). Covariates related to %WL at post-treatment included identifying as female ($\beta = -4.50$, $p = .021$) and having a higher baseline BMI ($\beta = -.29$, $p = .027$), both being negatively associated with %WL. Sex differences became insignificant, however, once positive psychology variables were added to the model while baseline BMI remained negatively associated with %WL ($\beta = -.29$, $p = .029$). At the 12-month follow-up, identifying as female was the only covariate of significance and was related to decreased %WL ($\beta = -7.28$, $p = .007$). This trend persisted after positive psychology variables were added ($\beta = -7.54$, $p = .005$). Table 2 showcases the coefficients table for both the post-treatment and follow-up complete case regressions when analysing hope as a unified variable.

## Complete case hope subcategories and weight loss

When reassessing post-treatment percent weight loss with the hope scale separated into its subcategories, pathways was significantly associated with post-treatment %WL ($\beta = .63$, $p < .001$) while both agency and goals were insignificant ($p = .689$, $p = .840$, respectively). This finding remained consistent at the 12-month follow-up, as pathways was again the only hope subcategory associated with %WL ($\beta = 1.02$, $p < .001$).

**TABLE 1** Demographics and descriptives.

| Variable (*units or possible range*) | Imputed sample data — Baseline (*N*=107), M±SD/*n* (%) | Complete case, Sample data — Post-treatment (*N*=70), M±SD/*n* (%) | Follow-up (*N*=61), M±SD/*n* (%) |
|---|---|---|---|
| Baseline age (*years*) | 45.37±11.26 | 45.46±11.57 | 44.97±11.75 |
| Sex | | | |
|     Male | 29 (27.10%) | 16 (22.86%) | 13 (21.31%) |
|     Female | 78 (72.90%) | 54 (77.14%) | 48 (78.69%) |
| Race | | | |
|     White | 82 (76.64%) | 58 (82.86%) | 50 (81.97%) |
|     American Indian/ Alaska Native | 5 (4.67%) | 4 (5.71%) | 3 (4.92%) |
|     Multi-racial | 6 (5.61%) | 3 (4.29%) | 3 (4.92%) |
|     Black or African American | 5 (4.67%) | 3 (4.29%) | 3 (4.92%) |
|     Other | 7 (6.54%) | 1 (1.43%) | 1 (1.64%) |
|     Asian | 2 (1.87%) | 1 (1.43%) | 1 (1.64%) |
| Baseline education | | | |
|     Less than high school | 1 (0.93%) | 1 (1.43%) | 1 (1.64%) |
|     High school graduate | 4 (3.74%) | 2 (2.86%) | 1 (1.64%) |
|     Some college | 13 (12.15%) | 7 (10.00%) | 6 (9.84%) |
|     Associate's degree | 6 (5.61%) | 2 (2.86%) | 2 (3.28%) |
|     Bachelor's degree | 34 (31.78%) | 25 (35.71%) | 20 (32.79%) |
|     Master's degree | 31 (28.97%) | 18 (25.71%) | 17 (27.87%) |
|     Professional degree (MD, DDS, etc) | 1 (.93%) | 1 (1.43%) | 1 (1.64%) |
|     Doctoral degree (PhD, EdD, etc) | 17 (15.89%) | 14 (20.00%) | 13 (21.31%) |
| ACEs total score (*0–10*) | 1.67±1.89 | 1.64±1.75 | 1.66±1.82 |
| Baseline positive psychology | | | |
|     HSR-2 Total Score (*18–144*) | 108.77±16.95 | 108.36±18.07 | 109.08±16.63 |
|       Agency (*6–48*) | 37.56±6.30 | 37.31±6.69 | 37.70±6.51 |
|       Pathways (*6–48*) | 36.89±6.38 | 36.94±6.43 | 36.97±6.34 |
|       Goals (*6–48*) | 34.32±6.86 | 34.10±7.20 | 34.41±6.47 |
|     PANAS – Positive affect (*10–50*) | 31.82±8.57 | 31.36±8.44 | 31.80±8.10 |
|     GQ-6 (*6–42*) | 36.75±5.09 | 37.40±4.38 | 37.18±4.31 |
|     LOT-R (*0–24*) | 15.29±5.30 | 15.24±5.33 | 15.07±5.34 |
| Weight measures | | | |
|     Baseline BMI (kg/m²) | 35.59±5.85 | 35.62±6.13 | 34.99±5.27 |
| | | Post-treatment (6 months) | Follow-up (12 months) |
|     Complete case %weight loss (lbs) | | 7.65±6.62 | 5.48±7.83 |
|     Imputed %weight loss (lbs) | | 7.51±6.52 | 5.25±7.37 |

Abbreviations: ACE, adverse childhood experiences; BMI, body mass index; GQ-6, gratitude questionnaire – 6-item form; HSR-2, adult hope scale – revised; LOT-R, life-orientation test-revised optimism scale; PANAS, positive and negative affect schedule.
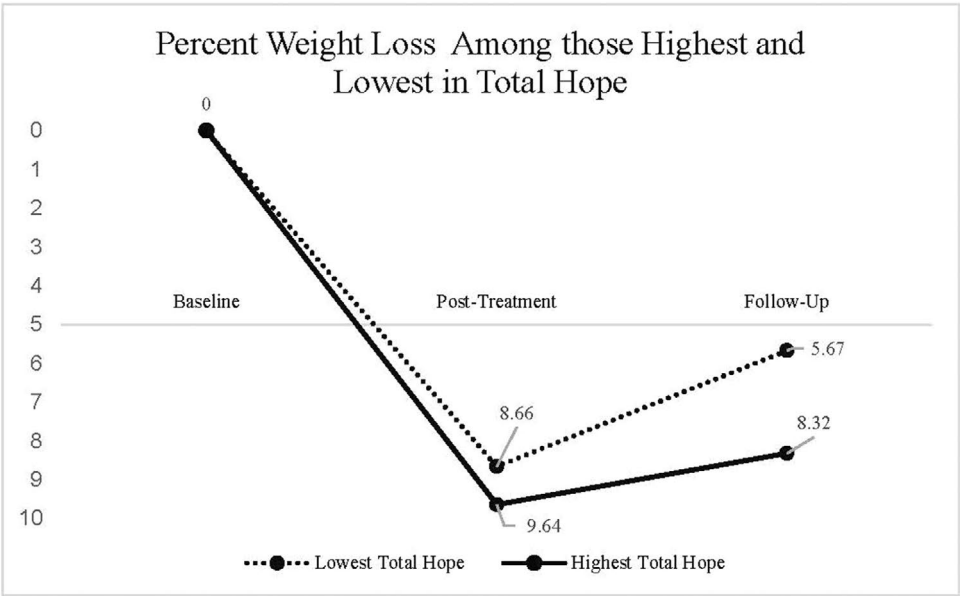
Highest and lowest hope are calculated as those in those highest and lowest HSR-2 quartiles (>=123 vs. <100, respectively). Horizontal axis cross at 5 indicates threshold for clinically significant weight loss of 5%.
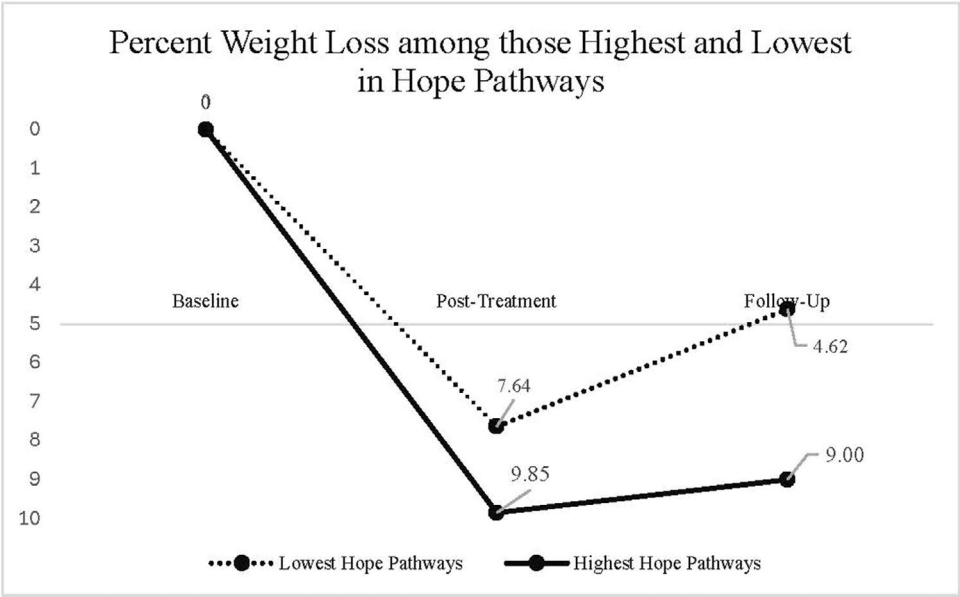


Highest and lowest pathways are calculated as those in those highest and lowest HSR-2 pathways subscale quartiles (>=42 vs. <33, respectively). Horizontal axis cross at 5 indicates threshold for clinically significant weight loss of 5%.

**FIGURE 1** Complete case percent weight loss among highest and lowest hope and pathways scores.

Gratitude was still negatively associated with %WL ($\beta = -.88$, $p < .001$) at post-treatment when assessing hope by subcategories, and this trend remained at follow-up ($\beta = -.85$, $p = .005$). Interestingly, optimism was also found to be negatively associated with %WL at the 12-month follow-up when

**TABLE 2** Complete case linear regressions with unstandardized coefficients: percentage weight loss regressed onto adult hope scale total score.

| Variable | Step 1 | | | Step 2 | | |
|---|---|---|---|---|---|---|
| | $\beta$ | $t$ | $p$ | $\beta$ | $t$ | $p$ |
| Post-treatment | | | | | | |
| Intercept | 18.55 | 2.54 | .013* | 30.52 | 3.44 | .001* |
| Age | .03 | .40 | .691 | .14 | 1.83 | .073 |
| Identifying as female | −4.50 | −2.38 | .021* | −3.04 | −1.60 | .115 |
| Education | .14 | .49 | .766 | .27 | .56 | .579 |
| ACE total | .59 | 1.29 | .201 | −.03 | −.05 | .959 |
| BMI | −.29 | −2.26 | .027* | −.29 | −2.24 | .029* |
| GQ-6 | | | | −.82 | −3.35 | .001* |
| LOT-R | | | | −.14 | −.72 | .472 |
| PANAS-positive affect | | | | −.05 | −.47 | .641 |
| HSR-2 total | | | | .16 | 2.54 | .001* |
| Follow-up | | | | | | |
| Intercept | 20.37 | 2.00 | .050 | 27.05 | 2.23 | .030* |
| Age | .02 | .20 | .842 | .11 | 1.09 | .280 |
| Identifying as female | −7.28 | −2.82 | .007* | −7.54 | −2.93 | .005* |
| Education | −.78 | −1.18 | .243 | −.75 | −1.14 | .261 |
| ACE total | .25 | .44 | .663 | −.26 | −.43 | .669 |
| BMI | −.20 | −.99 | .328 | −.25 | −1.29 | .204 |
| GQ-6 | | | | −.78 | −2.40 | .020* |
| LOT-R | | | | −.34 | −1.31 | .198 |
| PANAS-positive affect | | | | −.15 | −1.05 | .297 |
| HSR-2 total | | | | .29 | 3.12 | .003* |

*Note*: *p < .05.

Abbreviations: ACE, adverse childhood experiences; BMI, body mass index; GQ-6, gratitude questionnaire – 6-item form; LOT-R, life-orientation test-revised optimism scale; PANAS, positive and negative affect schedule.

separating hope into its subcategories ($\beta = −.69$, $p = .008$). Covariate relationships remained consistent with identifying as female ($\beta = −4.50$, $p = .021$) and BMI ($\beta = −.29$, $p = .027$) being negatively associated with post-treatment %WL. These trends also followed similar patterns, with sex becoming an insignificant factor and BMI remaining associated with %WL ($\beta = −.26$, $p = .033$) after adding positive psychology variables. However, age also became associated with increased %WL at post-treatment after the addition of positive psychology variables ($\beta = .18$, $p = .021$). Similar trends were found at follow-up, where identifying as female was negatively associated with %WL both prior to ($\beta = −7.28$, $p = .007$) and after the addition of positive psychology variables ($\beta = −8.04$, $p = .001$). Table 3 presents the regression table for the post-treatment and follow-up complete case analyses with the hope scale separated into its three subcategories.

## Intention-to-treat sample analyses

In the imputed intention-to-treat dataset, total hope was not found to be significantly associated with post-treatment %WL ($p = .114$), nor were any other positive psychology variables ($p$s from .089 to .877). Total hope was, however, trending towards an association with %WL at the 12-month follow-up ($\beta = .14$, $p = .062$) while all other positive psychology variables remained insignificant ($p$s from .179

**TABLE 3** Complete case linear regressions with unstandardized coefficients: percentage weight loss regressed onto adult hope scale total subscale scores.

| Variable | Step 1 | | | Step 2 | | |
|---|---|---|---|---|---|---|
| | $\beta$ | $t$ | $p$ | $\beta$ | $t$ | $p$ |
| Post-treatment | | | | | | |
| Intercept | 18.55 | 2.54 | .013* | 26.89 | 3.16 | .003* |
| Age | .03 | .40 | .691 | .18 | 2.37 | .021* |
| Identifying as female | −4.50 | −2.38 | .021* | −2.86 | −1.58 | .119 |
| Education | .14 | .49 | .766 | .50 | 1.07 | .287 |
| ACE total | .59 | 1.29 | .201 | −.22 | −.46 | .650 |
| BMI | −.29 | −2.26 | .027* | −.26 | −2.19 | .033* |
| GQ-6 | | | | −.88 | −3.75 | <.001* |
| LOT-R | | | | −.28 | −1.45 | .151 |
| PANAS-positive affect | | | | −.06 | −.56 | .574 |
| Hope: Agency | | | | −.07 | −.40 | .689 |
| Hope: Pathways | | | | .63 | 3.67 | .001* |
| Hope: Goals | | | | .03 | .20 | .840 |
| Follow-up | | | | | | |
| Intercept | 20.37 | 2.00 | .050 | 21.68 | 1.97 | .054 |
| Age | .02 | .20 | .842 | .13 | 1.44 | .156 |
| Identifying as female | −7.28 | −2.82 | .007* | −8.04 | −3.49 | .001* |
| Education | −.78 | −1.18 | .243 | −.41 | −.69 | .494 |
| ACE total | .25 | .44 | .663 | −.83 | −1.46 | .150 |
| BMI | −.20 | −.99 | .328 | −.18 | −1.03 | .308 |
| GQ-6 | | | | −.85 | −2.93 | .005* |
| LOT-R | | | | −.69 | −2.75 | .008* |
| PANAS-positive affect | | | | −.12 | −.93 | .355 |
| Hope: Agency | | | | −.10 | −.48 | .635 |
| Hope: Pathways | | | | 1.02 | 4.89 | <.001* |
| Hope: Goals | | | | .17 | .18 | .353 |

*Note*: *$p$ < .05.

Abbreviations: ACE, adverse childhood experiences; BMI, body mass index; GQ-6, gratitude questionnaire – 6-item form; LOT-R, life-orientation test-revised optimism scale; PANAS, positive and negative affect schedule.

to .590). Identifying as female was the only significant covariate associated with post-treatment %WL ($\beta$ = −3.45, $p$ = .033), but this relationship became insignificant with the addition of positive psychology variables ($p$ = .116). At follow-up, though, sex was associated with %WL both prior to ($\beta$ = −4.48, $p$ = .021) and after ($\beta$ = −4.22, $p$ = .041) positive psychology variables were included in the model. The regression results for the imputed data with total hope score are presented (Table 4).

Separating the total hope score into its subscales, results followed a similar trend to the complete case analyses. That is, pathways were significantly associated with increased %WL at both post-treatment ($\beta$ = .32, $p$ = .047) and follow-up ($\beta$ = .59, $p$ = .001) while agency and pathways were insignificant at both time points ($p$s from .334 to .802). All other positive psychology variables were found to be insignificant at both post-treatment ($p$s from .130 to .733) and follow-up ($p$s from .211 to .672). After accounting for the positive psychology variables, identifying as female was associated with %WL at follow-up ($\beta$ = −4.83, $p$ = .015). Regression results for the hope subscales are presented (Table 5).

**TABLE 4** Imputed linear regressions with unstandardized coefficients: percentage weight loss regressed onto adult hope scale total score.

| Variable | Step 1 | | | Step 2 | | |
|---|---|---|---|---|---|---|
| | β | t | p | β | t | p |
| Post-treatment | | | | | | |
| Intercept | 14.28 | 2.24 | .026* | 15.75 | 1.97 | .049* |
| Age | .05 | .78 | .434 | .09 | 1.40 | .162 |
| Identifying as female | −3.45 | −2.14 | .033* | −2.68 | −1.57 | .116 |
| Education | .14 | .32 | .753 | .14 | .30 | .761 |
| ACE total | .62 | 1.65 | .099 | .30 | .67 | .502 |
| BMI | −.23 | −1.95 | .052 | −.22 | −1.77 | .077 |
| GQ-6 | | | | −.30 | −1.70 | .089 |
| LOT-R | | | | −.19 | −.93 | .351 |
| PANAS-positive affect | | | | .02 | .15 | .877 |
| HSR-2 total | | | | .09 | 1.58 | .114 |
| Follow-up | | | | | | |
| Intercept | 17.07 | 2.22 | .027* | 17.50 | 1.87 | .062 |
| Age | .02 | .27 | .789 | .06 | .83 | .408 |
| Identifying as female | −4.48 | −2.32 | .021* | −4.22 | −2.05 | .041* |
| Education | −.59 | −1.13 | .257 | −.74 | −1.38 | .168 |
| ACE total | .02 | .05 | .958 | −.19 | −.36 | .717 |
| BMI | −.19 | −1.33 | .184 | −.22 | −1.47 | .141 |
| GQ-6 | | | | −.28 | −1.35 | .179 |
| LOT-R | | | | −.12 | −.54 | .590 |
| PANAS-positive affect | | | | −.10 | −.74 | .458 |
| HSR-2 total | | | | .14 | 1.87 | .062 |

*Note*: *$p < .05$.

Abbreviations: ACE, adverse childhood experiences; BMI, body mass index; GQ-6, gratitude questionnaire – 6-item form; HSR-2, adult hope scale – revised; LOT-R, life-orientation test-revised optimism scale; PANAS, positive and negative affect schedule.

# DISCUSSION

The current study examined whether overall levels of hope and its subscales – agency, pathways, and goals – uniquely predicted weight loss during a behavioural weight-loss trial of adults with overweight or obesity. In the completers sample, baseline hope overall was uniquely and positively associated with a greater percentage of weight loss at post-treatment and at 12-month follow-up – even when adjusting for other positive psychological constructs and covariates. In this sample, when assessing the hope subscales, pathways emerged as the only one to be uniquely associated with weight loss immediately post-intervention and at follow-up. The subscales of goals and agency were not uniquely associated with weight loss at any time point for completers – suggesting pathways was the driver of the relationship between the total hope score at baseline and ultimate weight loss up to 12 months later. Pathways being the lone driver of increased weight loss was also in stark contrast to previous assumptions that obesity and weight management were linked more to agency or related constructs (Grannell et al., 2021; Hilbert et al., 2008; Pearl & Lebowitz, 2014). Gratitude was also found to be consistently and negatively related to percent weight loss as those with lower levels of gratitude had greater weight loss among completers. A comparable pattern of results emerged using the intent-to-treatment sample – with the exception that total hope no longer predicted at post-treatment. Individuals highest in pathways not only lost more of

**TABLE 5** Imputed linear regressions with unstandardized coefficients: percentage weight loss regressed onto adult hope scale total subscale scores.

| Variable | Step 1 | | | Step 2 | | |
|---|---|---|---|---|---|---|
| | $\beta$ | $t$ | $p$ | $\beta$ | $t$ | $p$ |
| Post-treatment | | | | | | |
| Intercept | 14.28 | 2.24 | .026* | 13.49 | 1.68 | .093 |
| Age | .05 | .78 | .434 | .09 | 1.44 | .149 |
| Identifying as female | −3.45 | −2.14 | .033* | −3.02 | −1.80 | .073 |
| Education | .14 | .32 | .753 | .20 | .44 | .663 |
| ACE total | .62 | 1.65 | .099 | .28 | .64 | .520 |
| BMI | −.23 | −1.95 | .052 | −.20 | −1.68 | .093 |
| GQ-6 | | | | −.27 | −1.52 | .130 |
| LOT-R | | | | −.27 | −1.31 | .191 |
| PANAS-positive affect | | | | .04 | .34 | .733 |
| Hope: Agency | | | | −.06 | −.33 | .742 |
| Hope: Pathways | | | | .32 | 1.99 | .047* |
| Hope: Goals | | | | .04 | .25 | .802 |
| Follow-up | | | | | | |
| Intercept | 17.07 | 2.22 | .027* | 12.87 | 1.42 | .156 |
| Age | .02 | .27 | .789 | .07 | 1.00 | .318 |
| Identifying as female | −4.48 | −2.32 | .021* | −4.83 | −2.45 | .015* |
| Education | −.59 | −1.13 | .257 | −.62 | −1.20 | .231 |
| ACE total | .02 | .05 | .958 | −.21 | −.42 | .673 |
| BMI | −.19 | −1.33 | .184 | −.19 | −1.35 | .179 |
| GQ-6 | | | | −.22 | −1.09 | .278 |
| LOT-R | | | | −.28 | −1.25 | .211 |
| PANAS-positive affect | | | | −.05 | −.42 | .672 |
| Hope: Agency | | | | −.21 | −.97 | .334 |
| Hope: Pathways | | | | .59 | 3.25 | .001* |
| Hope: Goals | | | | .07 | .40 | .691 |

*Note*: *$p$ < .05.

Abbreviations: ACE, adverse childhood experiences; BMI, body mass index; GQ-6, gratitude questionnaire – 6-item form; LOT-R, life-orientation test-revised optimism scale; PANAS, positive and negative affect schedule.

their total body weight at post-treatment compared with those lowest in this construct (9.85% vs. 7.64% weight loss), they also maintained more of that loss at follow-up (9.00% vs. 4.62% weight loss).

To the best of our knowledge, this study is the first to examine Snyder's Hope Scale and its subscales as predictors of weight loss over long-term follow-up while adjusting for other positive psychological factors. It contributes to the mostly cross-sectional extant literature which suggests hope is related to self-reported physical activity and eating behaviours (Berg et al., 2011; Nothwehr et al., 2013; Van Allen & Steele, 2012) as well as BMI (Kelsey et al., 2011) by testing whether baseline levels of hope constructs longitudinally predicted actual behavioural outcomes – objectively measured – over a year. Findings are generally consistent, suggesting overall hope is related to these weight-related outcomes in adaptive ways, with some mixed findings on whether agency, pathways, or both drive the associations. Notably, some of the inconsistencies across studies may be due to the psychometric performance of the hope measures in certain studies. For example, Nothwehr et al. (2013) found agency more consistently predicted self-reported eating and exercise behaviours than pathways did; however, the internal consistency

of the pathways subscale was below threshold in that sample, which may have contributed to this pattern of findings. Taken together, the state of the current literature suggests the facets of Snyder's Hope Scale and other positive psychological constructs may be distinct in the way they predict weight loss and related behaviours, but more studies using objectively measured health outcomes are needed.

The potential reasons why only pathways predicted weight loss in our study may be related to the differential features of goal-setting, agency, and pathways on the road to goal attainment. In particular, while goal-setting involves having a specific future direction, and agency is the drive to reach towards that future, only pathways taps into the specific routes, problem-solving, and planning that might be required to achieve this desired future (Snyder, 1994). Indeed, pathways has been described as the 'waypower' counterpart to agency's connotated 'willpower' (Snyder, 1994). Some cultural idioms would suggest 'where there is a will there is a way' (Meriam Webster, 2025) However, our findings suggest believing you can find a way (or multiple ways) to a goal may not only be more predictive of your ultimate degree of success but also this perceived way-finding ability predicts independently of your so-called will (i.e., agency).

This pattern of results is supported by recent adjacent literature on positive fantasizing. Specifically, the work of Oettengin and team has found positive fantasies (i.e., positive mental imagining of future desired events) can actually hinder success because they cause people to expend less effort and take fewer actions to reach their goals (Oettingen & Mayer, 2002). In a previous behavioural weight loss trial (Oettingen & Wadden, 1991), the more positive fantasizing about weight loss participants had, the smaller their weight loss. The perception that weight loss would be achieved effortlessly and with little difficulty predicted less weight loss, whereas imagining future challenges and difficulties helped participants prepare for the upcoming temptations and hurdles. Since this earlier study, Oettengin and team have replicated such findings across a variety of goal-directed behaviours (e.g., job-seeking, securing romantic relationships, and recovering from hip surgery) (Oettingen, 2015), including eating behaviours (Johannessen et al., 2012).

Their results consistently show – while hopeful positive fantasizing alone did not help people reach their desired goals – two strategies did: mental contrasting and implementation intention (MCII) (Wang et al., 2021). Mental contrasting is a self-regulation strategy that helps people achieve goals by comparing their desired future to the current reality and the obstacles that may stand in their way. Implementation intention is the process of creating if-then plans to overcome those obstacles. MCII can help people avoid the pitfalls of only focusing on the positive outcome of a goal and allow them to anticipate the needed steps involved in achieving their goals. In contrast to agency, the pathways aspect of hope may tap into these abilities to visualize a plan to achieve these goals. Such work also aligns with findings that more specific planning and greater goals were associated with greater weight loss than less detailed plans with smaller goals (Dombrowski et al., 2016) and difficulties with planning are especially problematic to weight loss behaviours (Wong & Mullan, 2009).

While planning and believing in one's ability to plan may be important, it is also critical to note that access to resources can impact how these factors ultimately relate to healthy behaviour engagement. To illustrate, some weight management programmes are less effective for participants living near many fast-food restaurants and convenience stores or more effective for those living within a couple of miles of a supermarket (Tarlov et al., 2018). Similar effects have even been shown for bariatric surgery patients, such that those in areas with high densities of healthy food options, fitness facilities, and exercise opportunities had higher rates of total body weight loss than those in low-density areas (Koball et al., 2022). Living in well-resourced areas may also reflect higher socioeconomic status overall – which has further implications for economic stability, health care access and quality, neighbourhoods and built environments that promote healthy living, and other social determinants of health (Social Determinants of Health—Healthy People, 2030). These findings may speak to the importance of access to specific pathways and resources supporting weight loss behaviours. Even for the most hopeful individual with the highest levels of pathways thinking and effective MCII – their plans to engage in healthy weight behaviours may have more barriers to develop, be harder to enact, or might require more resources to enact if they are living as a member of a marginalized group or deprived community (Drewnowski, 2012).

Notably, the above literature may also help explain why lower gratitude was consistently positively associated with percent weight loss. Greater gratitude is associated with more contentment among other patient populations (Ruini & Vescovelli, 2013), but to change behaviour, a person must not be content with their status quo and must engage in new actions to close the gap between their current and desired state. Being content may be linked to a lack of goal activation and more withdrawal to reflect on recent goal attainment (Neal, 2016). Indeed, gratitude was not associated with goal attainment in a year-long prospective study (Sheldon et al., 2015). Consequently, someone with greater gratitude at the onset of a weight loss trial may experience higher levels of contentment with current behaviours, leading to less behaviour change and corresponding weight loss. In sum, higher hope, driven by pathways thinking, and lower gratitude with the current situation predicted greater weight loss. Consistent with Oettengin's recommendations (Oettingen, 2015), the answer is likely not to abandon other aspects of hope or recommend people reduce their sense of gratitude. Instead, it is about maximizing the potential of our hopeful fantasies by (a) acknowledging when we are discontent with our current circumstances and (b) mentally confronting the obstacles we are often encouraged to overlook or downplay but need to be considered on the path to successful goal attainment.

The present study benefits from several strengths. First, utilization of a clinical trial design, with 6- and 12-month follow-up allowed for experimentally induced changes in weight and objective measures of weight-related outcomes such as %WL and weight loss maintenance over time. Additionally, the inclusion of multiple positive psychology covariates improved analytical rigour by allowing us to test the unique effects of hope, adjusting for other positive constructs. Finally, implementing multiple imputation procedures accounting for missingness allowed for broader interpretation of our findings among study completers as well as the full cohort with intention-to-treat analyses. Despite these strengths, though, there were key limitations. First, the sample was relatively small and consisted primarily of white women in the United States with at least a bachelor's degree. Therefore, our results may not be representative of more diverse, international populations. Second, this was a secondary data analysis of a larger trial. Future studies would benefit from a priori design examining the role of hope subgroups as treatment heterogeneity factors. Additionally, replicating this pattern of results in a well-powered study would allow for stronger conclusions to be drawn. Next, although the study had 12-month follow-up, the impact of hope on longer term weight maintenance would be valuable to investigate. Lastly, future research should also examine other measures of hope and planning in order to disentangle the unique and/or relative role of these constructs and their facets in predicting weight loss. Alternative measures of hope include the Comprehensive Hope Scale (CHS) (Scioli et al., 2011), the Integrative Hope Scale (IHS) (Schrank et al., 2011), and the Herth Hope Index (HHI) (Herth, 1992) while measures of planning ability might include the Tower of London Task, Tower of Hanoi, or other measures of executive planning ability (Debelak et al., 2016; Goel & Grafman, 1995). Although there are limitations to the present work, these are balanced by some methodological strengths and – taken together – suggest these potential signals should be followed up in more rigorously designed studies (e.g., well-powered a priori design incorporating more diverse participants) of positive psychology variables and weight loss.

In conclusion, our study indicated baseline pathways thinking, a component of hope, predicted more weight loss immediately following a behavioural weight loss intervention and at the 12-month follow-up. Additionally, gratitude was found to be inversely associated with weight loss such that lower gratitude scores predicted more percent weight loss. Future research should further explore the role of hope, pathways thinking, and planning as they relate to both weight loss and weight maintenance and especially how these factors intersect with social determinants of weight regulation. Additionally, behavioural weight loss interventions may want to incorporate strategies like mental contrasting and implementation intentions for weight goals so participants perceive more confidence in their ability to achieve their goals.

## AUTHOR CONTRIBUTIONS

**Austin R. Medlin:** Conceptualization; methodology; data curation; investigation; formal analysis; visualization; writing – original draft; writing – review and editing. **Kelsey L. Sinclair:** Writing – original

draft; writing – review and editing. **Misty A. W. Hawkins:** Conceptualization; data curation; methodology; investigation; supervision; funding acquisition; writing – review and editing; writing – original draft; validation.

## DATA AVAILABILITY STATEMENT

Data are available via contacting the corresponding author but is not archived or available publicly.

## ORCID

*Austin R. Medlin* ⬚ https://orcid.org/0000-0002-4626-4541

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