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Using motivational interviewing to enhance emerging adults' engagement in weight loss: The Live Well RVA pilot randomized clinical trial

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Summary

Background: Emerging adults (ages 18–25) are at high risk for overweight/obesity, yet traditional adult behavioural weight loss (BWL) interventions do not meet the needs of individuals at this developmental stage. Motivational interviewing (MI) is an evidence-based approach to promote behaviour change but has not been tested for weight loss in this population. The study aimed to test the feasibility and preliminary efficacy of an MI-enhanced weight loss programme to promote engagement, retention and weight loss in emerging adults.

Methods: Emerging adults with overweight/obesity (N = 47, 81% female, 47% racial/ethnic minority, body mass index [BMI] = 33.2 ± 4.6 kg/m^2) were randomized to either standard BWL or MI-enhanced BWL (MIBWL). Weight was assessed objectively at baseline and posttreatment (3 months). Engagement (in-person session attendance [weeks 1 and 2], online self-monitoring [weeks 3–12] and online content viewing [weeks 3–12]) was tracked throughout the program.

Results: Though results did not reach the level of statistical significance, participants in MIBWL demonstrated greater programme engagement (77% vs. 61.0%, p = .11; Cohen d = .48), retention (71% vs. 48.0%, p = .10; Cohen h = .47) and intent-to-treat weight loss (−3.3% vs. −2.2%, p = .37; Cohen d = .26) compared with those in BWL.

Conclusions: Effect sizes suggest that MI might be a viable approach to enhance engagement and retention in weight loss programmes targeting emerging adults. This finding is meaningful, given the documented challenges with engagement and retention in this vulnerable population and the relationship between engagement and better weight loss outcomes. The results of this small pilot study support efforts to replicate these findings within the context of a fully powered trial.

KEYWORDS
emerging adulthood, lifestyle intervention, motivational interviewing, weight loss

1 | INTRODUCTION

In the United States, obesity is the third leading cause of preventable death[1] and is associated with $147 billion in medical costs annually.[2] The period between 18 and 25 years of age, known as 'emerging adulthood',[3,4] is a particularly high-risk period. Not only are these years associated with a host of unhealthy weight-related behaviours[5–11] but also more than 40% of 18–25 year olds already meet criteria for overweight or obesity, with rates approaching 50% among African-American/Black and Hispanic/Latino emerging adults.[12] Moreover, there are considerable cardiometabolic risks associated with obesity during these years, including diabetes, hypertension and hyperlipidaemia.[13] Thus, effective intervention during this transitional period is critical and could have significant public health implications in the way of decreased individual and societal costs associated with obesity as this generation ages.

Despite being at particularly high risk, data indicate that 18–25 year olds are all but absent from standard adult behavioural weight loss (BWL) programmes;[14] and even in recent BWL trials targeting young adults (18–35 years), emerging adults were still underrepresented, with the age of enrolled participants averaging 29 and 30 years.[15-18] This is concerning because data indicate that this age group (18–25 years) fares the worst in adult programs in terms of programme engagement and weight losses.[14] These data are not surprising given the unique considerations associated with emerging adulthood, a development period marked by instability and identity exploration.[4] Transitions during these years are numerous and include changes in romantic partners,[19] place of residence[20] and living situation (e.g., with roommates and with family of origin).[21] In fact, researchers have argued that it makes little sense to lump together individuals in their late teens and early 20s with those in their late 20s and early 30s, given the dynamic quality of the transition into adulthood and the considerable distinctions between the late teens/early 20s and the 30s in terms of education, work environment, marriage and family status.[3,4]

The need to develop targeted weight loss approaches to better meet the needs of emerging adults has been documented,[22–24] and initial work has begun in this area. Efforts have included a review demonstrating the lack of programmes designed specifically for this age group,[22] formative work to improve recruitment and retention,[23] trials for weight loss and weight gain prevention in college students[18,25–28] and initial randomized pilot trials testing BWL programmes adapted specifically for emerging adults.[29] Recruitment efforts have improved substantially, as evidenced by recent findings,[27,29] and initial pilot trials have reported promising short-term outcomes[27,29] that far exceed emerging adults' performance in adult BWL programmes.[14] However, weight losses achieved through these brief programmes have been modest, and programme engagement remains suboptimal, particularly within the context of technology-delivered programmes which have more appeal to this population.[23,30–32] Given the established relationship between programme engagement and weight loss outcomes, efforts to improve engagement among high-risk emerging adults are needed.

A brief programme grounded in motivational interviewing (MI) might be a natural fit to enhance engagement in this population. MI is an evidence-based therapeutic approach that is both client-centred and directive.[33] Of note, brief MI-based approaches have demonstrated efficacy in other areas of health promotion.[34,35] In particular, there is a sound evidence for brief motivational interventions with emerging adults and alcohol use—these interventions have led to reductions in drinking behaviour and alcohol-related problems with college students.[36–38] Additionally, MI fosters intrinsic motivation and supports autonomy for behaviour change, two factors that have been shown to be predictive of weight loss outcomes in adult populations.[39,40] Furthermore, when MI has been added to BWL protocols in adults, improvements in adherence and weight loss were observed.[41,42] Of note, however, previous applications of MI within the context of adult BWL have utilized adjunctive treatment models wherein MI sessions were added at a predetermined time point during a standard BWL treatment programme. Given that standard BWL is by nature quite prescriptive, group-based and does not allow for choice in programme goals, the additive effects of MI, while meaningful, might not fully harness the potential of MI to bolster engagement and motivation among emerging adults. Rather, a more integrated approach that adapts the treatment protocol itself to be more consistent with MI and integrates the MI spirit throughout treatment as opposed to prespecified time points might hold particular promise with this age group, but to the authors' knowledge, this has not been previously tested.

To that end, a randomized controlled pilot trial (*Live Well RVA*) was designed to assess the feasibility and preliminary efficacy of a brief, MI-enhanced weight loss intervention developed specifically for emerging adults 18–25 years of age, relative to an adapted standard behavioural treatment arm that was matched on contact. The primary aim was to determine whether the MI-enhanced approach would produce superior engagement and retention. The secondary aim focused on whether this approach was a potentially viable model for achieving clinically significant weight loss in emerging adults. Finally, participant satisfaction with both approaches was assessed, as well as any changes in potential mechanisms of change consistent with MI (e.g., autonomous motivation and autonomy support).

2 | MATERIALS AND METHODS

2.1 | Participants

Inclusion criteria were (a) age 18–25 years and (b) body mass index (BMI) of 25–45 kg/m^2. Exclusion criteria included (a) uncontrolled medical condition that would pose a safety risk for weight loss or unsupervised exercise (e.g., uncontrolled hypertension); (b) current pregnancy, lactation or planned pregnancy during the study period; (c) use of weight loss medications or participation in another weight loss program; (d) reported heart condition, chest pain or loss of consciousness on the Physical Activity Readiness Questionnaire (PAR-Q); (e) psychiatric hospitalization in the last 12 months; (f) weight loss of

greater than 5% within the previous 6 months; (g) reported history of, or current eating disorder diagnosis; (h) lack of regular Internet access; (i) inability to speak English; (j) do not live, work or go to school within a 30-mile radius of the research lab; (k) unwilling to be randomized to either treatment arm. Participants who reported medical conditions that could interfere with their ability to safely complete the intervention were required to obtain written physician permission to participate.

2.2 | Procedures

Participants were recruited using a multi-method community-based recruitment plan that included: digital and print advertisements, radio advertisements, email blasts, listservs, flyers posted in locations frequented by emerging adults (e.g., college campuses and local coffee shops) and word of mouth. All materials had a website address included that directed potentially interested participants to a study recruitment website where they could learn more about the trial. Those who were interested were able to then link to a secure platform to complete a brief prescreen questionnaire to determine their initial eligibility. Individuals who appeared eligible were invited to attend an individual orientation meeting where the details of the study were described in greater depth and informed consent was obtained. Those who signed consent were scheduled to complete their baseline assessment visit. All participants who completed baseline visits and remained eligible based on in-person screening were eligible for randomization. Procedures were approved by the Virginia Commonwealth University Institutional Review Board.

2.3 | Study design

Live Well RVA (short for Richmond, VA) was a parallel randomized controlled pilot trial wherein participants were assigned to one of two conditions: motivational interviewing-enhanced BWL (MIBWL) or standard BWL. Randomization was stratified based on sex and race/-ethnicity (non-Hispanic White vs. racial/ethnic minority). Both arms included a 12-week evidence-based BWL intervention with content that had been adapted specifically to meet the needs of this age group. The contact schedule was identical across arms and consisted of two in-person individual sessions in weeks 1 and 2, followed by email/online contact in weeks 3–12. Assessments occurred at baseline and 3 months (postintervention).

2.4 | Components similar across intervention conditions

2.4.1 | Contact schedule and mode

All participants received two individual, in-person sessions with an interventionist ('lifestyle coach'); sessions were designed to be 75–90 min in length, and although some content differed by arm (see below), the general goals were to provide an overview of BWL concepts and core behavioural strategies, as well as to personalize goals. In brief, participants received an overview of the behavioural approach to weight loss, including self-regulation, energy balance and hands on training in core BWL skills including self-monitoring, goal setting and problem solving. Participants worked with their coach to select personalized goals and implementation strategies to assist them in meeting their weekly weight loss goals. In subsequent weeks (3–12) all intervention contact occurred remotely; each week, participants received an email with a link to new content for the week, as well as a link to a secure survey where they were asked to report their nutrition, activity and weight for the week. In addition, the survey provided an opportunity for participants to ask questions and discuss barriers or successes they experienced that week with her/his coach to further personalize the e-coaching received.

2.4.2 | Core BWL content

Content was identical across groups. Participants received 12 weekly lessons consisting of evidence-based BWL content,[43,44] adapted to emphasize goal-setting and behaviour change surrounding high-risk weight related behaviours in emerging adulthood (e.g., alcohol, fast food and sugar sweetened beverages). These lessons have been used in the first author's previous work with emerging adults 18–25 years of age.[29]

2.4.3 | Behavioural goals and strategies

Participants received personalized calorie and fat goals based on starting weight designed to produce a 1 and 2 pounds per week weight loss. Participants were instructed to self-monitor weight, calories, fat grams and minutes of physical activity in an effort to meet weight loss goals. Participants were taught to consume a diet low in saturated fat and energy density. Participants were also encouraged to work toward a goal of 250 min/week of moderate intensity physical activity, with weekly goals accumulating based on their baseline level.

2.4.4 | Personalized feedback on progress

Participants submitted their self-monitoring data weekly during the 3-month programme and received personalized feedback on their progress and coaching to assist them in meeting goals. Feedback was focused on goal attainment and progress, noting specific behaviours (e.g., self-monitoring) and outcomes (e.g., weight loss) and encouraged use of core behavioural strategies including goal setting and problem solving. Participants were encouraged to email their coach with questions, but it was not the expectation that participants would respond to their feedback message.

2.5 | Components unique to MI-enhanced condition

2.5.1 | Lesson content

Standard BWL materials and lesson content for participants were adapted so that the language reflected MI principles, while retaining core BWL content. Examples include avoiding the expert role by framing education and strategies in terms of what is known from research and what other young adults have found helpful and highlighting autonomy and choice with respect to behavioural strategies.

2.5.2 | In-person session content and choice in behavioural goals

The MIBWL condition was designed to provide an autonomy-supportive environment wherein participants could explore their reasons for wanting to lose weight and select appropriate strategies for doing so. Thus, the first portion of session 1 was a brief (~20 min) MI intervention meant to identify participant motivations and values, confront ambivalence regarding behaviour change, elicit change talk and determine confidence level. These processes occurred within the context of a values-checklist task,[45] wherein participants were presented with a list of values and asked to select the three that were most important to them. The lifestyle coach then engaged the participant in a discussion of those values in the context of their eating and exercise behaviours. Following this, the lifestyle coach guided the participant through a portfolio containing his or her physical measurements (taken at baseline assessment: weight, BMI, body composition, waist circumference, blood pressure, blood glucose and cholesterol levels) alongside healthy norms and standards. The next 20–30 min were spent reviewing this information in an MI-consistent elicit-provide-elicit framework. Participant baseline measures were presented in an objective, nonjudgmental manner, and any interpretation of these was provided by the participant. When necessary, reactions were probed for by the lifestyle coach's use of open-ended questions. This process was meant to increase intrinsic motivation for weight loss and foster an awareness of the discrepancy between normative values and participant values on these health indices.

The remaining session time (20–30 min) was spent reviewing the behavioural approach to weight loss and introducing options for evidence-based eating, activity and self-monitoring plans. The eating plan options were a low-calorie diet with 30% calories from fat or a low-carbohydrate, high-lean-protein diet. There were also three activity goals from which participants could choose: 250 min of moderate-intensity activity per week, 1500 calorie expenditure per week, or 10,000 steps (using a pedometer) per day. Lastly, participants could choose whether they want to self-weigh daily or weekly and whether they want to track eating and activity using a pen-and-paper diary or a smartphone application. All options provided were grounded in extant evidence and designed such that any combination of options would produce a weight loss of 1 and

2 pounds per week. After these possibilities were discussed, the participant was asked to spend the next week thinking about which options might work best for them. Of note, the provision of choice in behavioural goals across these dimensions is in contrast to standard BWL which is typically quite prescriptive on these domains.

At the second in-person session, the lifestyle coach assessed the participants' motivation and confidence regarding eating, activity and self-monitoring plans and then asked the participant to choose those that he or she would like to try (one eating plan, one activity plan, one weighing schedule and one recording method). Based on participant selection, the lifestyle coach reviewed the plan details and helped the participant develop a more concrete plan for the changes they might consider making—again in an MI-consistent, elicit-provide-elicit manner. Lastly, the lifestyle coach introduced the schedule for the remainder of the 10 weeks and answered any additional questions that the participant had.

2.5.3 | Autonomy supportive e-coaching and automated normative feedback

Participants received a brief weekly survey to assess confidence and motivation and also to assess in a single item their current behaviour as it related to the weekly session topic (e.g., current fast food consumption and current sedentary behaviour). Participants then received in-the-moment automated normative feedback based on their reported behaviour (see Table 1 for example). Participants received e-coaching on an identical contact schedule and with the same goals as outlined above (see Personalized Feedback on Progress), but feedback was framed in an autonomy-supportive manner, avoiding the expert role and highlighting participants' choice and volition.

2.6 | Intervention training and fidelity monitoring

Interventionists were doctoral students in clinical psychology with relevant experience and skills and were trained and supervised by a clinical psychologist with expertise in BWL and the adapted protocol. To ensure competency in delivering an MI-based intervention, they attended a two-day workshop conducted by an experienced practitioner of MI and member of the MI Network of Trainers (coauthor M.K.B.) and subsequently audio recorded mock sessions to practice basic MI skills including open-ended questions, affirmations, reflective statements, summary statements, developing discrepancy and eliciting change talk. These sessions were submitted to constructive critiquing in supervision meetings and coded by raters trained in the MITI 3.1 coding system.[46] Established cut-offs suggested by the MITI 3.1 were used to determine competency.

Manuals were developed for in-person sessions, and a protocol was developed for e-coaching to standardize contact frequency and content. Sessions were audio-recorded, and e-coaching messages

TABLE 1 Example of automated normative feedback in the motivational interviewing-enhanced behavioural weight loss (MIBWL) arm

Question: On a typical weekday, how much time do you spend doing something sedentary (e.g. watching TV, on a computer or tablet, sitting in a car or bus)?

If participant's response is <2 hours: You may have heard that young adults spend about 8 hours each day in sedentary activities, and that being sedentary for 2 or more hours each day is associated with increased risk for health problems. By engaging in sedentary activity for less than 2 hours per day during the week, you are in great shape in this department!

If participant's response is = 2 hours: You may have heard that young adults spend about 8 hours each day in sedentary activities, and that being sedentary for 2 or more hours each day is associated with increased risk for health problems. Your level of sedentary activity during the week is right on target with current recommendations. If you decide to limit sedentary activity even further, you might notice some additional weight management and health benefits.

If participant's response is >2 hours: You may have heard that young adults spend about 8 hours each day in sedentary activities, and that being sedentary for 2 or more hours each day is associated with increased risk for health problems. Your current level of sedentary activity during the week is more than what is recommended for successful weight management. This may be an area that you choose to focus on in the week ahead. One option is to take a slow and steady approach – decrease your sedentary behaviour by 30 min per day each week until you are sedentary less than 2 hours per day. If you decide to use this strategy or other methods to limit sedentary activity, you might notice some additional weight management and health benefits.

reviewed weekly. A fidelity checklist was used to ensure topics were covered as planned that interventionists delivered the material with competence and skill and that no protocol deviations occurred—the checklist included the following domains: content and contamination (yes/no/partial) and competence (Likert scale ranging from 1 [not at all] to 5 [a lot]). There were a total of 17 competency domains rated using the Likert scale—some were appropriate for both arms (e.g., established rapport and maintained warm interaction style), and others were arm-specific and designed to assess competence specific to the MI-enhanced condition and to monitor potential contamination of communication style in the BWL arm (e.g., emphasized participant's personal choice and autonomy for behaviour change, avoided the expert role). The first author (J.G.L.) reviewed session audio using the checklist, and the intervention team (J.G.L., A.L. and E.R.) met weekly for supervision to ensure fidelity to the protocol and address any barriers or implementation questions as they arose.

To formally examine adherence to MI within this integrated intervention model, 10% of participants were randomly selected from each treatment arm, and two raters with established interrater reliabilities (intraclass correlations greater than or equal to 80%) independently rated their intervention sessions (in-person audio recordings and e-coaching transcripts) using the MITI 3.1. For each selected participant, 20 min of each session and 1 randomly selected week of e-coaching were rated. In-person sessions were first stratified into thirds and then random 20 min segments within each third were selected to ensure representation of treatment content. Because the MITI has not been validated for use with e-coaching, modifications were made to accommodate this format (e.g., lack of reciprocal interaction between coach and participant within an exchange). An average of the two ratings was used in analyses.

2.7 | Measures

Assessments were completed by trained and certified assessors who were masked to treatment allocation. Measures were obtained at 0 and 3 months, unless otherwise noted.

2.7.1 | Demographics

At baseline participants reported gender, age, race and ethnicity, work and school status.

2.7.2 | Anthropometrics

Height was measured at baseline only to the nearest millimetre using a wall-mounted stadiometer and a standard protocol. Weight was measured to the nearest .01 kg in light clothes without shoes using a calibrated digital scale at 0 and 3 months. BMI was calculated as weight in kg/height in metres^2. Percent weight loss was calculated as follows: ((posttreatment weight − baseline weight)/baseline weight) * 100.

2.7.3 | Engagement

Programme engagement was assessed by tracking the following: attendance at the two initial in-person sessions, self-monitoring and reporting of key behaviours (weight, calories, fat grams and physical activity) during weeks 3–12. All metrics were coded as yes (1) or no (0) for a given week.

2.7.4 | Retention

Attendance at 3-month follow-up assessment was dummy coded yes (1) or no (0).

2.7.5 | Autonomous motivation

Autonomous self-regulation was assessed using the Treatment Self-Regulation Questionnaire (TSRQ).[47] The TSRQ asks individuals why they would try and control their weight and lists 12 different reasons. Half of the items reflect autonomous motivation (e.g., 'Because

I feel that I want to take responsibility for my own health') and half reflect controlled motivation (e.g., 'Because I would feel guilty or ashamed of myself if I did not try to control my weight'). Participants were asked to respond on a 7-point scale ranging from 'not at all true' to 'very true' to indicate the extent to which each reason was true for them. The TSRQ has adequate reliability (α > .80) and construct validity.[47]

2.7.6 | Autonomy support

Autonomy support was assessed using the Health Care Climate Questionnaire (HCCQ) at posttreatment only. The HCCQ is a 15-item questionnaire designed to assess perceptions of autonomy support. Participants respond on a 7-point scale ranging from 'strongly disagree' to 'strongly agree'. It was used to assess to degree to which participants perceived their coach to be autonomy supportive. The HCCQ has demonstrated excellent internal consistency (α = .95) in a community adult population,[48] and has been used in a variety of topic areas including weight loss, smoking cessation and diabetes.[48–50]

2.7.7 | Satisfaction

Participants reported overall programme satisfaction and whether they thought the programme would be relevant to others their age interested in weight loss.

2.8 | Statistical analyses

All analyses were conducted using IBM SPSS Statistics for Windows, Release 25.0.0 (IBM Corp.©, 2017, Armonk, NY, www.ibm.com). Descriptive analyses were conducted on baseline demographic characteristics of participants. Initial weekly engagement was binary-coded based on whether participants attended both session visits for in-person contacts during weeks 1 and 2. Each week, a participant reported weight during the technology-mediated weeks 3 to 12 was counted as one and a sum score over those 10 weeks was used for group comparison analyses. Chi-square tests were used to examine all categorical and binary outcome variables, and analysis of variance (ANOVA) was used to examine group differences on continuous variables, including percent weight loss under intent-to-treat (ITT) analyses with baseline observation carried forward (BLCF) and also for completers-only analyses. We selected BLCF over other approaches to handling of missing data given the small sample size and only two data points (0 and 3 months) available in this short-term pilot study. Effect size calculations[51] are reported as Cohen d statistic for continuous variable comparisons and Cohen h statistic for chi-square tests of proportions. Effect size interpretations for both Cohen d and Cohen h are based on conventions that classify values of both effect size statistics as small (.2), medium (.5) or large (.8).

3 | RESULTS

3.1 | Participants

Participants (N = 47) were 21.9 ± 1.9 years of age, with a mean BMI of 33.2 ± 4.6 kg/m^2. They were predominantly female (81.0%) and never married (74.5%). Participants were 53% non-Hispanic White, 26% African-American/Black, 11% Hispanic/Latino, 6% Asian and 4% multiracial. A total of 40% were employed full time, and 51% were full time students. See Figure 1 for CONSORT diagram.
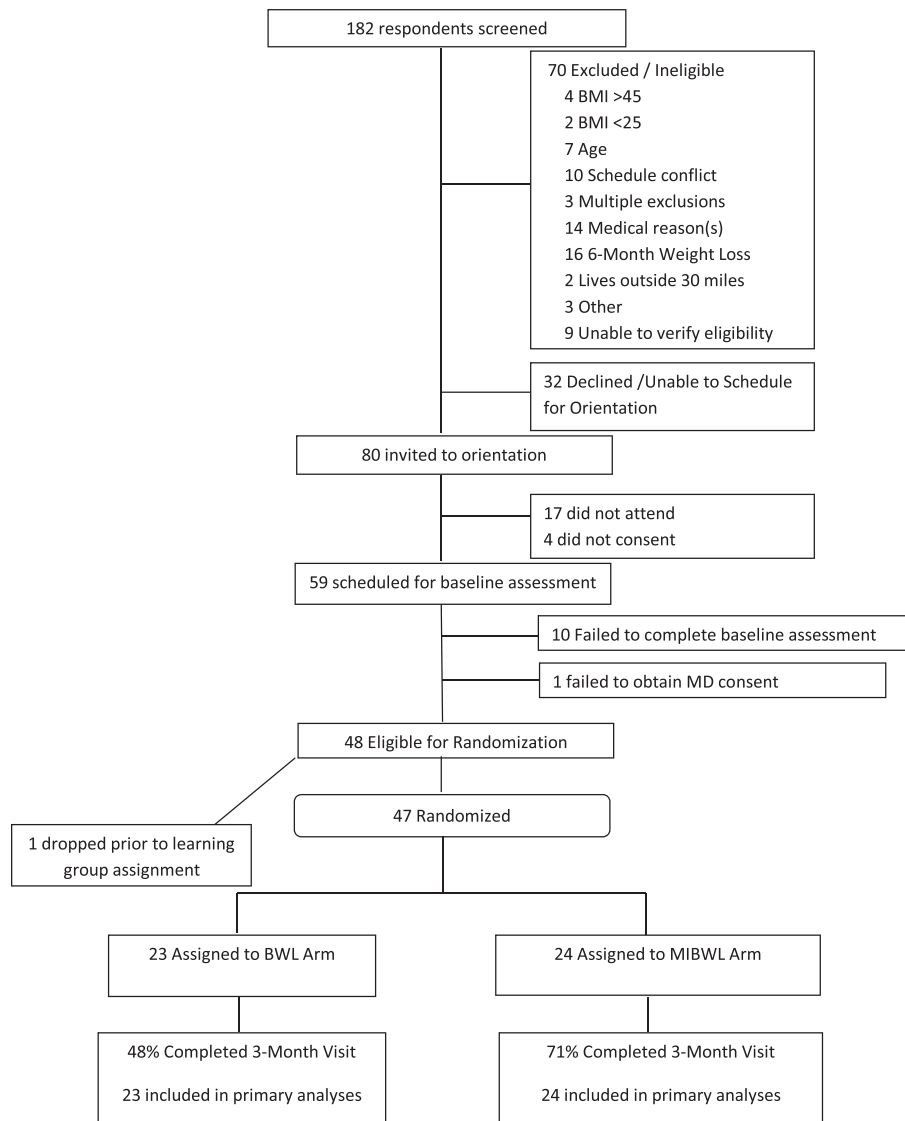
3.2 | Intervention fidelity

The fidelity checklists that were used for ongoing monitoring reflected that all planned topics were delivered as intended (i.e., 100% received 'yes' checks with no instances of 'no' or 'partial'). Further, the intervention style ratings reflected a high level of overall competence by the coaches (i.e., average 4.6 on a 5-point scale). Moreover, contamination was quite infrequent—there were only four instances of contamination documented across all in-person sessions—none of which were noted in the MIBWL arm, but rather, each instance reflected some contamination in the BWL arm wherein the interaction style was consistent with the MI spirit (e.g., highlighting participant autonomy). Similarly, 100% of feedback messages were provided as intended, with core elements included in all messages and a high degree of interventionist skill and competence (i.e., average 4.8 on a 5-point scale and no instances of contamination).

With respect to formal MI ratings, in session 1, MI competency thresholds were exceeded in MIBWL across MITI domains, whereas standard BWL sessions were below these thresholds on all but % complex reflections, suggesting successful implementation of the MI-enhanced treatment. MI adherence was less clear in session 2 and e-coaching: although the global MI spirit was higher in MIBWL than standard BWL, there was little distinction between the two treatments on behavioural domains: Both treatment arms were assessed as being below MI competency thresholds in session 2 and at or above MI competency in the e-coaching. See Table 2 for summary.

3.3 | Engagement and retention

Patterns of weekly engagement by intervention condition are displayed in Figure 2. All MIBWL arm participants (100%) attended both in-person sessions in weeks 1 and 2 compared with 87% of participants in BWL arm (p = .067; Cohen h = .78). Average technology-mediated engagement in weeks 3–12 (i.e., reporting of self-monitoring data, which drove e-coaching) was 72% in MIBWL arm compared with 54% in BWL arm (p = .128; Cohen d = .45). Overall engagement (in-person and technology-based combined) was 77% in MIBWL compared with 61% in BWL (p = .11; Cohen d = .48) A total

FIGURE 1 CONSORT diagram

182 respondents screened

70 Excluded / Ineligible
  4 BMI >45
  2 BMI <25
  7 Age
  10 Schedule conflict
  3 Multiple exclusions
  14 Medical reason(s)
  16 6-Month Weight Loss
  2 Lives outside 30 miles
  3 Other
  9 Unable to verify eligibility

32 Declined /Unable to Schedule for Orientation

80 invited to orientation

17 did not attend
4 did not consent

59 scheduled for baseline assessment

10 Failed to complete baseline assessment

1 failed to obtain MD consent

48 Eligible for Randomization

47 Randomized

1 dropped prior to learning group assignment

23 Assigned to BWL Arm

24 Assigned to MIBWL Arm

48% Completed 3-Month Visit

23 included in primary analyses

71% Completed 3-Month Visit

24 included in primary analyses

of 71% of participants in the MIBWL arm completed posttreatment assessment compared with 48% of participants in the BWL arm ($p = .10$; Cohen $h = .47$). In addition, those participants in the MIBWL arm were encouraged to self-select goals for diet and exercise from a menu of evidence-based options; 15 participants selected to track their eating in terms of protein and carbohydrates, whereas nine participants elected to track calories and fat; 16 participants opted to track their exercise in total minutes, whereas four participants selected calories expended and four participants chose to track their exercise in steps.

3.4 | Weight loss

In ITT analyses, participants in the MIBWL arm had greater percent weight loss at 3-months than those in the BWL arm, although the differences were not statistically significant ($-3.3 \pm 3.8\%$ vs. $-2.2 \pm 4.1\%$, $p = .37$, Cohen $d = .26$; see Figure 3). In subsequent analyses including only those participants who attended the posttreatment visit, mean percent weight losses were nearly identical between groups ($-4.6 \pm 3.7\%$ in MIBWL vs. $-4.6 + 5.0\%$ in BWL, $p = .98$), and a similar proportion of participants achieved a 5% weight loss (53% in MIBWL vs. 45% in BWL, $p = .70$).

3.5 | Other intervention targets consistent with MI framework

Modest increases in autonomous self-regulation were observed in both groups from baseline to 3 months, with no significant differences by condition ($p = .83$). Reductions in controlled motivation were also observed at 3 months, with no significant differences between intervention arms ($p = .56$). Perception of autonomy support at posttreatment was higher in the MIBWL condition, and differences were consistent with a large effect size (102 ± 6.7 vs. 94 ± 14.8, $p = .08$, $d = .77$).

TABLE 2 Motivational interviewing proficiency compared with recommended proficiencies using the MITI 3.1

MITI domain	Mean rating session 1 M (SD)		Mean rating session 2 M (SD)		Mean e-coaching M (SD)		MITI 3.1 recommended proficiencies	
	MIBWL	Standard	MIBWL	Standard	MIBWL	Standard	Basic competency	Proficiency
Global spirit[a]	4.72 (.10)	3.39 (0.25)	4.44 (0.10)	3.67 (0.47)	4.83 (0.17)	4.33 (0.00)	3.5	4
Reflection: question[b]	1.23 (0.43)	0.98 (1.00)	0.66 (0.19)	0.84 (0.32)	1.97 (0.80)	2.75 (2.48)	1.0	2.0
%Complex reflections[c]	92.37 (7.88)	53.16 (27.61)	66.70 (15.42)	75.3 (2.79)	61.67 (34.03)	63.69 (2.60)	40%	50%
%Open questions[d]	64.17 (27.09)	15.75 (9.32)	30.53 (8.95)	27.97 (0.27)	79.17 (26.02)	73.33 (9.42)	50%	70%
%MI adherent[e]	100.0 (0.0)	79.22 (20.46)	78.78 (6.42)	75.63 (8.75)	100 (0.0)	96.89 (4.42)	90%	100%

Note: Ten percent of participants' encounters (n = 6) were rated independently by two raters with established interrater reliabilities >0.80 across domains; an average rating presented.

Abbreviations: MIBWL, motivational interviewing-enhanced behavioural weight loss; MITI 3.1, Motivational Interviewing Treatment Integrity Code, Version 3.1.

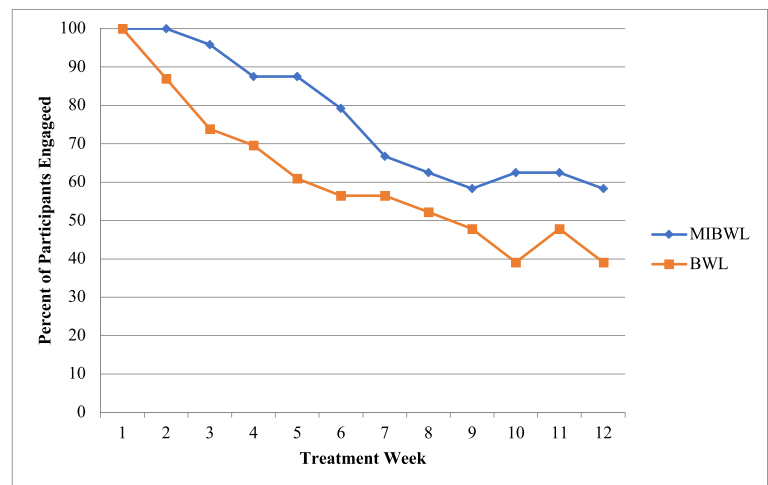[a]Global spirit = (evocation + collaboration + autonomy) /3.
[b]Ratio = total reflections/total questions.
[c]%Complex reflections = (complex reflections/total reflections) × 100.
[d]%Open questions = (open questions/total questions) × 100.
[e]%MI adherent = MI adherent/(MI adherent + MI nonadherent).

FIGURE 2 Patterns of engagement by intervention condition


3.6 | Satisfaction

Overall, participants who attended the posttreatment visit reported high satisfaction with this adapted program, regardless of intervention arm. For example, when asked about their willingness to recommend the programme to others their age, responses in both conditions were quite positive (7.5 vs. 7.3 on an 8-point scale for MIBWL vs. BWL, respectively, p = .72). However, there were some notable differences in satisfaction in favour of the MIBWL arm; these included the following items, all of which were assessed on an 8-point scale: 'how helpful was the information to meet your weight loss goals' (7.6 vs. 6.3, p = .015, d = 1.01) and 'information I learned would be relevant to others my age who want to lose weight' (7.7 vs. 6.9, p = .10, d = .66). Also of note, almost all participants in the MIBWL arm (94%) indicated

they would pick the MIBWL group if they could go back and select the group to which they were assigned, compared with the standard group participants where about half (54.5%) reported they would pick the same group, and the other 45.5% indicated they would have preferred the MIBWL group.

4 | DISCUSSION

This MI-enhanced approach to BWL treatment demonstrated initial feasibility and has the potential to improve engagement and retention within BWL programmes adapted specifically for emerging adults. Indeed, although differences in engagement and retention did not meet the threshold for statistical significance in this small pilot study,
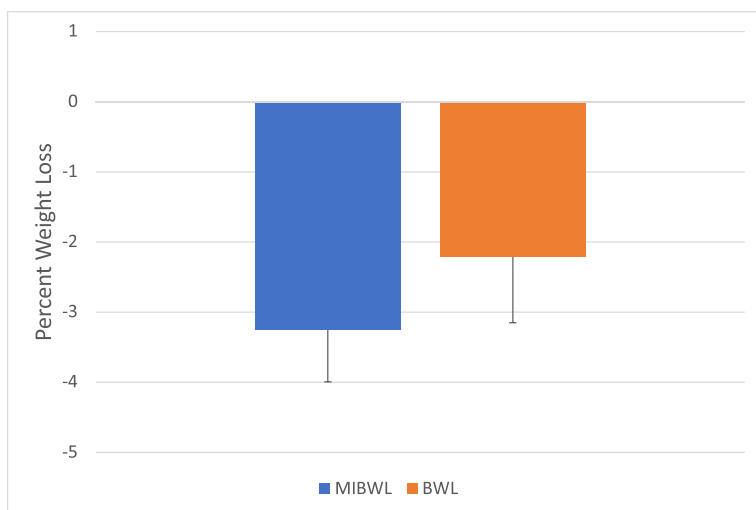
FIGURE 3 Intent-to-treat weight losses by intervention condition

the effect sizes observed suggest that these differences could be clinically significant. This is consistent with previous findings demonstrating that MI is capable of improving adherence in BWL programmes—both for adolescents and adults.[52,53] In general, MIBWL interventions show promise for enhancing outcomes[52–54]; however, systematic reviews note that more research is needed with respect to eHealth/telehealth interventions and that treatment fidelity reporting is frequently overlooked[53,54]—gaps addressed by the current study. Specific to the emerging adult population, brief MI interventions have also been shown to produce favourable outcomes with respect to change in alcohol use behaviour—even among those who were mandated to receive counselling.[37] In contrast to the current intervention, those MI interventions targeting other health behaviours among emerging adults (e.g., alcohol use) produce large effects with briefer duration; however, these programmes typically focus on one specific behaviour rather than the multiple behaviour change approach required to produce weight loss. Thus, it may be the case that integrating MI throughout the treatment programme in combination with a more intensive or interactive platform may be necessary to maintain engagement and support behaviour change over time for emerging adults participating in a weight loss programme, which by nature is complex and requires multiple behaviour changes.

The detailed fidelity monitoring is a strength of this investigation and highlights the potential difficulty of integrating MI with BWL treatment, which is typically quite information dense and prescriptive by nature. Fidelity checklists and session 1 MITI ratings support that session 1 was distinct in implementation and consistent with MI, which likely reflects that the majority of this session was not 'integrated' with BWL content. Rather, session 1 was designed to allow sufficient time to explore participant motivations and values, confront ambivalence regarding behaviour change, elicit change talk, provide personalized normative feedback and determine confidence level. In contrast, MI adherence was less evident on the MITI for session 2, likely owing to the greater proportion of BWL content in this session, including a combination of psychoeducation and behavioural skills training. Of note, provision of choice surrounding these behavioural goals and strategies was emphasized in session 2, as was the

use of an elicit-provide-elicit style, but the technical elements of MI were still lower than anticipated when assessed by the MITI. At the same time, it is important to consider that the MI spirit was high in both MIBWL sessions and far exceeded ratings for the BWL arm. There is an ongoing debate regarding the relative importance of the relational (i.e., spirit) or technical (i.e., behavioural domains) components of MI for eliciting behaviour change.[55] Future research should examine which of these mechanisms might be most important for emerging adults within the context of behavioural weight management. Given the developmental need for autonomy, it is plausible that the relational elements of MI might be more salient in promoting engagement for this population.

Weight losses were not significantly different between conditions in this pilot trial. However, findings do suggest there might be potential for an MI-enhanced approach to improve weight loss outcomes in this population. Of note, weight losses in the MIBWL arm compare favourably to those achieved in other recent weight loss trials targeting emerging adults.[18,26] Further, on average, participants in the MIBWL achieved greater than a 3% weight loss which is the threshold for clinical significance as noted in the current obesity management guidelines,[56] given weight losses of this magnitude are associated with improvements in cardiovascular risk factors. Moreover, there was less variability in outcomes in the MIBWL arm compared with the standard BWL arm. Taken together, this provides some initial support for the potential clinical benefit of this type of approach. Furthermore, the differential effects observed for perceived autonomy support are quite robust, both in terms of the magnitude of the differences between conditions and with respect to notably less variability in the MIBWL arm. Previous findings indicate that autonomy support at posttreatment predicts greater success with long-term weight management,[39] and thus, it is possible that effects produced by MIBWL would be more meaningful over a period of long-term follow-up. Given that this was a brief pilot study, these results demonstrate initial promise and highlight the need for additional testing of this type of programme with a larger sample over a longer duration.

Though both arms were rated favourably by participants, several indicators suggest that the MIBWL arm was better suited to present

weight loss strategies in a way that appealed to emerging adults. First, the finding that participants in the MIBWL group found the programme information to be more helpful and more relevant to other emerging adults is of particular interest given that the information provided was identical across arms. Only minor modifications to wording/phrasing were made in the MIBWL content to underscore autonomy and to enhance participants' application of normative feedback. An important consideration regarding programme content, however, is the provision of choice surrounding diet and exercise goals, which could have influenced participants' perception regarding the helpfulness of the programme overall and ultimately influenced engagement. Additionally, upon completion of the programme, the vast majority of participants assigned to the MIBWL arm reported that they would opt for that same group if given the choice, whereas only approximately half of those assigned to BWL would choose to be in the BWL arm. Lastly, retention was higher in the MIBWL arm, reflecting greater willingness of these participants to continue with the programme over the course of 3 months. Taken together, these data suggest that the explicit provision of choice and underscoring of participant autonomy in the MIBWL arm was appealing to emerging adults seeking to lose weight. This is consistent with formative work highlighting the importance of choice rather than directive prescriptions or one-size-fits-all recommendations.[23] These findings are also consistent with those of another pilot trial,[29] which revealed promising outcomes from a BWL programme for emerging adults grounded in self-determination theory (SDT). SDT highlights autonomy as a fundamental component for developing intrinsic motivation, but is not synonymous with MI, as it also emphasizes the importance of relatedness and competence, which were fostered in this previous pilot trial by offering closed-group experiential cooking and physical activity classes for participants. It is possible that combining the approach described in the current study with that of an SDT-informed programme could bolster outcomes by explicitly providing MI while also providing group-based or peer elements to enhance relatedness and competence.

In conducting this pilot trial, a number of important lessons emerged regarding this type of work with this unique and underserved population. First, *Live Well RVA* differed from the first author's previous and ongoing work with emerging adults in that assessments were conducted at a clinical research services unit (CRSU) rather than her own lab due to construction during the time of this trial which precluded the visits from being conducted in dedicated research space. The CRSU is a clinical unit within the hospital and as such, patients with a variety of medical diagnoses are being seen for research protocols, and attending visits required participants to navigate a large hospital. This is in stark contrast to the lab space, which is housed in a building owned by the health system but is completely separate and embedded within the downtown community—participants are able to enter a single building, and the location is easily accessible by foot and public transportation. Moreover, because the lab space was designed for research and not clinical care, no other patients are present, and the space itself does not appear clinical in nature, but rather like an office environment. Despite attempts to minimize barriers associated with the off-site assessments—including providing payment for valet parking and conducting assessments using staff known to participants—CRSU visits appeared to present an obstacle to retention for emerging adults in this study. Compared with the authors' previous work with this population,[29,57–59] study retention at the posttreatment assessment was significantly lower; in addition, anecdotal comments from participants reflected a discomfort with attending assessment visits in a hospital-based setting, which is an important consideration for future intervention trials targeting this age group.

Sustained engagement was also found to be a notable concern in this study, particularly in the second half of treatment (see Figure 1). This is consistent with other recent findings which have documented early disengagement among emerging and young adults.[31,32] A prespecified protocol for reengagement allowed for email and phone contacts at key time points, but these were largely unsuccessful. The majority of reach-outs were not reciprocated, and conducting check-ins via phone was generally challenging due to participant scheduling issues, screening of calls and preference for nonphone methods of communication. These issues highlight the need to develop effective methods for reengaging participants who may be struggling—but perhaps more importantly, the need to preemptively identify those who could benefit from additional support prior to their disengagement.

Lastly, as is common in BWL trials, all coaches were trained in and delivered both intervention approaches in order to reduce the potential for error attributable to therapist effect. However, in exit interviews with coaches, it was discovered that they found it difficult to alternate between approaches. Following extensive MI training, it was challenging to 'turn off' those skills during sessions with BWL participants—particularly when the MI spirit aligned with the coach's preexisting therapeutic style. Had the BWL coaches never been trained in the MIBWL protocol, it is plausible that the observed treatment effects might have been greater between conditions. Thus, future tests of this type of approach should consider using coaches trained in and aligned with the specific treatment arm to alleviate this potential concern.

The current findings should be interpreted in light of some limitations. First, the sample size for this initial pilot trial was small; as such, there was not adequate statistical power to conduct between-group comparisons. Further, the overall retention rate is a concern. At the same time, this is a high attrition risk population, which has been well documented,[14,24,60,61] and the primary aim of the proposed pilot trial was to determine whether the MI-enhanced approach might promote better engagement and retention—indeed, the observed effect sizes suggest this model may hold potential to do so. Further, although modifications were made and decision rules were consistently applied to accommodate use of the MITI with e-coaching, this approach has not been validated; as such, MITI ratings on e-coaching segments should be interpreted with caution. Additionally, the approach to handling of missing data was not ideal, and alternative approaches such as multiple imputation or maximum likelihood would be preferable in future trials with larger samples and longer-term follow up. These limitations must be viewed in the context of the study's numerous

strengths, which include a randomized design with contact-matched treatment between arms and medium-to-large effect sizes for primary outcomes of interest. In addition, enrollment with respect to race/-ethnicity and student status was impressive, strengthening the generalizability of these results. Moreover, the detailed fidelity monitoring, including use of the MITI to assess MI adherence, is a strength. Finally, to the authors' knowledge, the MIBWL intervention described in this paper is the first test of an MI-enhanced approach to BWL designed specifically for emerging adults.

In sum, findings suggest that MI might be a viable approach to enhancing engagement and retention among high-risk emerging adults. Further, integrating the spirit of MI throughout the intervention as opposed to using MI as an adjunctive treatment model might be particularly effective with this population. Given well-documented challenges with engagement and retention in this high-risk population and the established relationship between engagement and better weight loss outcomes, this finding is meaningful. Future work should seek to replicate these findings in a larger sample over longer-term follow up—in addition, future studies should attempt to optimize outcomes by strengthening mechanisms by which MI might operate.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to disclose.

AUTHOR CONTRIBUTIONS

Study concept and design (J.G.L. and A.A.G.); obtained funding (J.G.L., A.A.G., K.B.C. and J.L.F.); intervention development (J.G.L., A.A.G., M.K.B., K.B.C., A.L. and E.R.); trial execution and acquisition of data (J.G.L., M.K.B., A.L. and E.R.); data cleaning and analysis (J.L.F.); drafted manuscript (J.G.L., A.L., J.L.F. and E.R.); revised manuscript for important intellectual content (J.G.L., M.K.B., K.B.C. and A.A.G.).

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