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Goal difficulty and goal commitment affect adoption of a lower glycemic index diet in adults with type 2 diabetes

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Abstract

Objective—Few studies have examined the effect of goal difficulty on behavioral change even though goal setting is widely used in diabetes education. The effect of a goal to consume either 6 or 8 servings/day of low glycemic index (LGI) foods was evaluated in this study.

Methods—Adults 40–65 years old with type 2 diabetes were randomly assigned to the 6 or 8 serving/day treatment group following a 5-week GI intervention. Perceived goal difficulty, commitment, satisfaction, and self-efficacy were evaluated, and four day food records assessed dietary intake.

Results—Both groups increased consumption of LGI foods ($P < 0.001$); there were no significant differences in the change in consumption between groups. Participants who were more committed to the goal perceived the goal to be less difficult ($P < 0.01$). Those with greater efficacy beliefs were more committed to their goal, perceived the goal to be less difficult, and were more satisfied with their performance (all $P < 0.05$).

Conclusion—A specific goal regarding LGI foods can facilitate the adoption of a lower GI diet. Future research is needed to determine if goal commitment or goal difficulty mediate the process.

Practice implications—Clinicians should help clients set specific goals regarding dietary change.

Keywords

Type 2 diabetes mellitus; Patient education; Health behavior; Goals; Nutrition assessment

1. Introduction

Effective diabetes management requires the adoption of multiple lifestyle behaviors, including eating a healthful diet [1]. The belief that people can motivate themselves, regulate their behavior, and change detrimental habits lays the foundation for self-management. The fundamental question is why some people achieve greater change than others. To effectively change behavior, people must monitor the behavior they seek to change, set attainable goals to direct their efforts, develop effective strategies for goal attainment, and persist over time [2].

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Previous research demonstrated behavioral interventions achieve their results primarily through goal setting and strengthening efficacy beliefs [3-5]. The higher one's sense of efficacy, the higher the goal that is set and the more successful one is in preventing relapse. Those who have a strong belief in their efficacy tend to regard a relapse as a temporary setback and reinstate control [6]. Thus, goal setting is one of the most widely used techniques in interventions [7]. Evidence from field studies indicates specific, challenging goals strengthen efficacy beliefs (which are specific to each behavior) and enhance motivation [8]. However, much of the goal setting research has been conducted in work motivation and human resource management [2,9]. Little research has investigated optimal goal-setting procedures for behavioral change in diabetes management, even though goal setting is widely used in clinical care [4,9].

A core component of patient education and counseling for diabetes management is nutrition counseling. Prior research showed lower glycemic index (GI) diets improved dietary quality, weight management and glycemic control [10-12]. GI classifies carbohydrate-containing foods according to their postprandial glucose response [13]. The adoption of a lower GI diet may improve diabetes outcomes [10-12]. Therefore, the purpose of this pilot study was to evaluate the effect of an intervention in adults with type 2 diabetes, which emphasized the incorporation of low GI (LGI) foods, on self-efficacy and dietary intake. Participants were randomly assigned to incorporate either 6 or 8 servings/day of LGI foods into their diet to determine whether a more difficult goal facilitated greater change. No specific recommendations regarding the number of servings of LGI foods to consume to achieve a low GI diet have been reported. However, a recent meta-analysis of 37 prospective studies found the median dietary GI was 54, and diets with a higher GI independently increased the risk for certain chronic diseases, such as cardiovascular disease [14]. We estimated that 6–8 servings/day of LGI foods would achieve a dietary GI of ~54 based on sample menus created *a priori*, and therefore, established 6–8 servings/day of LGI foods as the dietary goals for the current study. Goal setting research found that people who attempt specific and relatively difficult goals perform better on a task than people who try for specific but easy, vague, or no goals at all [2]. Both goals were equally specific in the current study and estimated to represent a reasonable level of difficulty in a free-living population with 8 servings being more difficult than 6 servings. We hypothesized the 8 serving/day group would achieve greater improvements in self-efficacy and consumption of LGI foods than the 6 serving/day group.

2. Goal setting theory

Goal setting theory has been reviewed extensively elsewhere[15,16]. Briefly, a goal is defined as something one wants to accomplish [16] or the object or aim of an action [17]. The theory asserts that goals motivate action, and specific goals lead to higher levels of performance than general "do your best" goals or no assigned goals [16-18]. The relation between goal difficulty and behavior, however, is more complex. At low levels of goal difficulty, there is a positive linear relationship between goal difficulty and task performance; harder goals lead to better performance than easy goals [17]. Across the entire range of goal difficulty there is a curvilinear relationship with performance. Goal difficulty is associated with an increase in performance until challenging goals are perceived to be impossible and effort diminishes [19]. Thus, it is critical to set specific goals and to set goals with appropriate difficulty to ensure goal attainment.

Beliefs of personal efficacy and goal commitment may mediate goal attainment [20]. For example, efficacy beliefs influence the level of difficulty at which goals are set, the strength of commitment to goals, the strategies used to achieve goals, and the effort expended in the face of obstacles [8]. The more capable people believe themselves to be, the more confident

they are that goals can be attained, the more firmly committed they remain, and the more positively they respond to negative feedback. Similarly, individuals who are highly committed to a goal perform at higher levels than those with less commitment [20,21]. Finally, feedback provides information regarding the degree to which the goal is met followed by self-reaction. If the goal is met or exceeded, satisfaction ensues and self-efficacy is increased for future goal attainment [2,22]. If the goal is not met but the person is satisfied with the effort extended, then the goal is abandoned. If, however, the goal is not met and the person is dissatisfied with this level of performance but is confident that performance can be improved, then a higher goal is set [2]. Thus, goal setting directs effort and motivation, efficacy beliefs affect goal commitment, commitment affects task persistence, goal attainment increases satisfaction and efficacy beliefs, and heightened satisfaction and efficacy beliefs lead to a more ambitious goal.

3. Methods

3.1. Participants

Eligible participants were 40–65 years old, diagnosed with type 2 diabetes for ≥1 year, had a glycosylated hemoglobin (A_{1c}) value ≥7%, and were not on insulin therapy. A score of <20 on the Mini-Mental Status examination [23] or prior instruction in GI were criteria for exclusion. Participants were recruited through classified advertisements, employee newsletters, health fairs, medical practices, neighborhood health centers, and flyers. All study methods were approved by the Institutional Review Board at the sponsoring institution, and participants provided written informed consent.

3.2. Research design

A randomized two-group parallel research design was employed. Following recruitment, participants completed baseline assessment administered by the study dietitian and then attended a 5-week nutrition intervention (see below) led by the same dietitian. Following the intervention, participants met individually with a dietitian from the university Clinical Research Center (CRC) to receive their randomization assignment. (The study dietitian and the CRC dietitian were different individuals.) Participants were assigned to either a more difficult goal (8 servings/day of LGI foods; 8 LGI group) or an easier goal (6 servings/day; 6 LGI group). Randomization assignment was determined using randomization software and placed in a sealed envelope. The CRC dietitian opened the envelope during the individual appointment with the participant and informed participants they were encouraged to consume either 6 or 8 servings/day of LGI foods (called “goal assignment” for study purposes). During this appointment, the dietitian also helped participants target dietary changes which were specific to their eating patterns to meet their GI goal. Participants were followed for approximately eight weeks following goal assignment. Midway through this period, participants met with the CRC dietitian individually again to assess their progress. The CRC dietitian assessed how well participants believed they were meeting their goal and addressed barriers to change and additional strategies for incorporating LGI foods as indicated. The length of the CRC appointments varied based on individual participant needs.

Participants were asked to self-monitor their diet and blood glucose at least 4 days/week during the 8-week monitoring period. Monitoring forms to better standardize the type of information recorded (i.e., type, quantity and preparation method of food consumed, GI values, and blood glucose values) and booklets with the GI value of commonly consumed foods were provided. Participants were encouraged to return their records to the study dietitian weekly who reviewed the records upon receipt and provided standardized feedback. The study dietitian, who coordinated the feedback, was blinded to goal assignment. Final

data collection was coordinated by the study dietitian and occurred at study end following the 8-week monitoring period.

3.3. The nutrition intervention

The intervention included five weekly group educational sessions which were approximately 1.5 h long. The intervention objectives were to improve skills and self-efficacy for incorporating LGI foods in various settings and situations. The sessions addressed the concept of GI, the relation between dietary intake and postprandial glycemia, factors influencing the GI value of foods, strategies for substituting low for higher GI foods, portion estimation, dietary and glucose self-monitoring to assess goal attainment, and approaches for maintaining behavioral change. Each session included hands-on activities to improve skills such as selecting lower GI foods when dining out, recipe modification to lower the GI value of recipes, and strategies for choosing lower GI foods when grocery shopping.

3.4. Study measures and time points

Data collection occurred at four time points: at baseline prior to the intervention, following completion of the 5-week intervention, upon completion of the goal assignment appointment, and following the 8-week monitoring period at study end. Dietary intake, physical activity and medications were assessed at baseline and study end. Participants were instructed to keep a 4-day food record (three weekdays and one weekend day) to assess intake. These food records were entered into Nutrient Data Systems for Research (NDS-R, version 2008, Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN) to assess GI and food servings consumed. GI values range from 0 to 100 and glucose equals 100. From the dietary records, foods were assigned to 1 of 166 subgroups, which were automatically generated from the NDS-R food/nutrient database. Food subgroups were combined into categories for analyses. Number of servings consumed was based on the 4-day mean intake. In general, whole fruits, vegetables (except white potatoes), whole grain pasta, dairy products, nuts, and seeds were used to quantify number of servings of LGI foods consumed [24]. One serving was defined as the quantity of food in one serving on food labels [25], which concurred with the information presented during the intervention. Food servings were quantified per 1000 kcal to control for energy intake. Physical activity was assessed using the Modifiable Physical Activity Questionnaire, which assesses leisure physical activities during the past week, and was shown to be reliable and associated with activity and physical fitness measures previously [26]. Participants were asked to record the type, dose and frequency of prescribed medications via interview at assessment visits.

Self-efficacy was the only measure assessed at all four time points. Training in the target behavior can increase efficacy beliefs for that behavior; thus, self-efficacy was assessed upon completion of the 5-week intervention to determine the effect of the intervention on efficacy beliefs. Self-efficacy also was assessed following goal assignment. Goal setting theory suggests self-efficacy can increase before performance ever occurs since the assignment implies the individual is capable of attaining the goal [2]. Finally, self-efficacy was assessed at study end to determine the effect of potential goal attainment on efficacy beliefs.

An instrument adapted from a previously developed questionnaire to assess self-efficacy for consuming LGI foods was used for assessment purposes [27]. The instrument included three subscales: the GI efficacy subscale (6 items) evaluated confidence for choosing and preparing LGI foods; the goal difficulty subscale (8 items) evaluated confidence for consuming 1–8 LGI foods/day; and the negative food selection subscale (3 items) evaluated difficulty in choosing LGI foods. Response options ranged from 0 = strongly disagree to 10 = strongly agree, and negatively stated items were reverse scored. The coefficient α for

internal consistency was ≥0.77 for subscales and coefficient *H* values were ≥0.80 in previous research [27].

Perceived goal difficulty, commitment, and satisfaction were assessed following goal assignment and study end as participants did not know their goal at baseline or immediately following the intervention and could not provide valid estimates for these measures at those time points. We hypothesized goal difficulty would be higher for those assigned to the 8 than the 6 LGI group, participants in the 8 LGI group would be more committed to the goal, and goal attainment would increase satisfaction in both treatment groups.

Perceived goal difficulty was assessed with 1-item, where participants ranked how easy or difficult it would be to reach their goal on a 9-point scale [28]. Goal commitment was assessed with a previously validated questionnaire that included both positively and negatively stated items regarding participants' determination to achieve the goal [19]. The instrument reflects cognitive (e.g., "I think this goal is a good goal to shoot for."), affective (e.g., "Quite frankly, I don't care if I achieve this goal or not."), and behavioral (e.g., "It wouldn't take much to make me abandon this goal.") components. Coefficient a for this scale was 0.80 previously [19]. Response options ranged from strongly disagree to strongly agree using a 5-point scale. Negatively stated items were reverse scored and a higher mean scale score indicated greater levels of commitment. Goal satisfaction was measured with 1-item in which participants rated their level of satisfaction or dissatisfaction in meeting their goal on a 9-point scale [29].

3.5. Statistical analyses

The distribution of outcomes was examined to assess normality and ensure the assumptions of statistical tests were met. Fisher's exact test or two-sample *t*-tests compared between-group differences in participant characteristics at baseline. Repeated measures analysis of variance with contrast analysis evaluated between- and within-group differences in outcomes across time. Subjects were nested within groups and were treated as random effects.

Additional analyses were conducted to determine the effect of goal difficulty for each individual on outcomes. The difference between the servings of LGI foods each participant consumed at baseline compared to the individual's assigned goal of either 6 or 8 LGI servings was calculated. That difference was divided by the number of calories consumed by the individual at baseline in units of 1000 (i.e., 2.4 represent 2400 kcal). This value was labeled "individual goal" for purposes of analysis. A higher score required more change in food choices to achieve the assigned goal and was considered more difficult. A negative score was possible, indicating the individual consumed more servings of LGI foods at baseline than assigned during the study. In addition, the number of servings/1000 kcal of LGI foods each participant consumed at baseline and study end was determined. The change in servings was calculated, with a higher score indicating greater consumption of LGI foods at study end. Pearson correlation coefficients were calculated to explore relationships among individual goal, perceived goal difficulty, commitment, self-efficacy, satisfaction, and servings consumed for all study participants. All analyses were completed using SAS JMP (version 8.0, 2008, SAS Institute, Cary, NC).

4. Results

Two hundred nine people inquired about the study and 184 were screened for study eligibility. Of those screened, 59% did not meet the inclusion criteria, 16% declined to participate, 46 were enrolled, 11 did not complete the intervention, and 35 completed all assessments. At baseline, there were no significant differences in any outcome measures

between groups (Table 1) or between those who did or did not complete the intervention. Physical activity and prescribed medications were similar between groups throughout the study and did not change significantly. There was no significant difference between treatment groups in the number of self-monitoring records received, reviewed, or the amount of feedback provided.

Immediately following goal assignment, there were no significant differences between groups in perceived goal difficulty, commitment or satisfaction (Table 2). However, mean difficulty ratings for the 8 LGI group were higher than the 6 LGI group following goal assignment ($P = 0.14$). At study end, participants in the 8 LGI group perceived their goal to be significantly more difficult ($P = 0.002$) and were significantly less committed to the goal ($P = 0.03$).

There were no significant differences in self-efficacy between groups at baseline or post intervention (Table 3). Self-efficacy significantly increased for both groups following the intervention and remained high for the duration of the study.

There were no significant differences between groups in total energy intake, total servings of LGI foods consumed, or GI at baseline or study end (Table 2). However, both groups had a significant increase in total servings of LGI foods and a significant decrease in energy intake and dietary GI (all $P < 0.001$). Both groups had a significant increase in fruit consumption, and participants in the 8 LGI group reported a significant increase in consumption of vegetables, nuts and seeds (all $P < 0.05$).

Sixty percent of the participants had a positive individual goal, indicating they consumed fewer servings of LGI foods at baseline than the goal assigned. Participants who consumed fewer LGI foods at baseline perceived their goal to be more difficult following goal assignment; however, the relation was not statistically significant ($r = 0.20$; $P = 0.26$) (Table 4). This association between participant's individual goal and goal difficulty approached significance at study end ($r = 0.31$; $P = 0.07$) (data not shown). Immediately following goal assignment, participants who were more committed to their goal perceived the goal to be less difficult ($r = -0.52$; $P < 0.01$). Following goal assignment, as self-efficacy increased goal commitment significantly increased ($r = 0.59$; $P < 0.001$) and goal difficulty significantly decreased ($r = -0.38$; $P < 0.05$). At study end, self-efficacy was positively related to goal satisfaction ($r = 0.36$; $P < 0.05$).

5. Discussion and conclusion

5.1. Discussion

This is one of the first studies reported to empirically evaluate the relation between perceived goal difficulty and dietary behavioral change. There was no significant difference between treatment groups in consumption of LGI foods following goal assignment or at study end. However, mean servings of LGI foods consumed in each group at study end met the assigned goal of that group. Mean consumption of LGI foods at baseline for participants in the 6 LGI group was slightly more than 6 servings/day. The assigned goal did not ask participants to consume fewer servings of LGI foods than the number of servings consumed at baseline; rather, participants in the 6 LGI group increased consumption of LGI foods and exceeded their goal at study end. Participants in the 8 LGI group consumed fewer servings of LGI foods at baseline than assigned and achieved the assigned goal of 8 servings/day. Thus on average, goal attainment was achieved.

Goal attainment can be influenced by perceptions of goal difficulty. There were no significant differences between treatment groups in perceptions of goal difficulty

immediately following goal assignment as participants had not yet attempted to achieve their goal. The difficulty ratings at study end declined for participants in the 6 LGI group; this rating reflects the finding that participants were assigned a relatively easy goal. In contrast, the difficulty ratings for the 8 LGI group at study end were significantly higher than the 6 LGI group. At study end, the difficulty ratings for the 8 LGI group reflect the challenge of attaining a new, more difficult goal.

Furthermore, the 8 LGI group was significantly less committed to the goal. When individuals have had no previous experience with a complex task such as choosing LGI foods, specific hard goals may not lead to better performance [2]. Under these conditions, individuals seem to choose less than optimal strategies for goal attainment. Participants met with the CRC dietitian twice in this study to assist them in developing effective dietary strategies. However, one month elapsed between these visits which may be too long for a new, difficult behavior. More frequent contact (e.g., weekly or biweekly in person or by phone) may be needed during the initial stages of attempting to achieve a new, difficult goal.

The assigned goal given to participants in this pilot study was not based on servings of LGI foods consumed at baseline for each individual. Information regarding the magnitude of change in consumption of LGI foods following a behavioral intervention was not available in the literature at study initiation. The 6 and 8 serving goals were estimated based on dietary patterns (not servings consumed) from intervention and feeding studies regarding GI [30-32] and sample menus created a priori. Energy intake decreased at study end in this study which likely reduced the total servings of LGI foods consumed. The findings obtained indicate adults with type 2 diabetes can increase consumption of LGI foods by almost 2 servings/day. An individualized goal setting approach requires additional time at baseline and trained staff to collect dietary intake records and complete the dietary assessment and food group analysis. However, an individual goal of substituting 2 additional servings/day of low for higher GI foods is feasible. These findings provide the basis for evaluating the effect of goal difficulty more precisely in future studies.

Moreover, the mean decrease in dietary GI in the current study was greater than the mean (SD) decrease in GI in a previous study (-2.08 ± 5.11 to -2.80 ± 6.07) in which participants were encour-aged to substitute lower for higher GI foods [10]. The information provided during the intervention regarding GI in the previous and current study was similar. However, no specific goal regarding the number of LGI foods to consume was provided in the previous study. Taken together, the findings support the need to set specific goals as purported by goal setting theory, rather than vague or “do your best” goals, to facilitate greater behavioral change.

In addition to information regarding consumption of LGI foods, this study yielded findings about potential mediators of change, and the associations among these variables. These findings provide evidence of the importance of self-efficacy and goal commitment to achieve change. Participants who reported higher levels of commitment to the goal perceived the goal to be less difficult. Correlational analyses showed those with higher efficacy beliefs following goal assignment were more committed to the goal, perceived the goal to be less difficult, and were more satisfied with their performance. Whether negative discrepancies between the goal and behavioral performance strengthen or diminish commitment is partly determined by beliefs that one can attain the goal [8] and the degree to which stated goals express enduring interests and values of the individual [33,34]. When faced with barriers and failures, people who distrust their capabilities wane from their efforts or abort their attempts prematurely and settle for mediocre results. Those who have strong belief in their capabilities intensify their efforts, deepen their commitment, and persist until they succeed. As people approach or surpass their goal, they often set more ambitious goals.

Thus, self-efficacy may mediate behavioral change to adopt a lower GI diet partly by affecting levels of goal commitment and commitment may affect task persistence. While measures of self-efficacy, goal commitment, and goal difficulty were obtained in this study, mediation analyses were not performed due to the small sample size. Future research with larger samples should evaluate whether self-efficacy, goal commitment, and goal difficulty mediate the adoption of a lower GI diet.

A few limitations of the study should be noted. First, the sample consisted primarily of white, employed individuals who had received previous diabetes education; the generalizability of the findings among a more culturally diverse sample is not known and should be determined in future studies. Second, a 1-item measure was used to assess satisfaction and perceived goal difficulty, and single item measures may be less reliable than a more comprehensive assessment [35]. Future studies should include a more comprehensive assessment of difficulty and self-reactions, including qualitative interviews upon study completion, regarding goal attempts. Third, other variables, such as level of literacy or numeracy and degree of previous diabetes education received, may influence efficacy beliefs and should be explored in future studies. Fourth, the study had 80% power to detect a mean difference between treatment groups of 2 servings/1000 kcal in the change in servings of LGI foods with the observed sample size and standard deviations obtained; future studies should consider this difference in power analyses. Finally, a wait list control group was not employed in the current study because the purpose of the study was to evaluate the effect of two dietary goals. Prior research found no significant decrease in dietary GI among participants in the control group [10]. However, further research using a control group is needed to confirm the effect of the intervention on behavioral change.

5.2. Conclusion

In summary, there was no significant difference between treatment groups in consumption of LGI foods at study end. However, a specific goal to incorporate 6–8 servings/day of LGI foods increased consumption of LGI foods by almost 2 servings/day in this sample of adults with type 2 diabetes. The assignment of 8 servings/day was perceived to be more difficult than 6 servings/day. Participants who were less committed to the goal perceived the goal to be more difficult; however, those with greater efficacy beliefs reported higher levels of commitment. Future research is needed to determine if the assignment of a specific, individual difficult goal promotes greater change than a specific, generic difficult goal and whether self-efficacy, goal commitment, and/or perceived goal difficulty mediate the process.

5.3. Practice implications

Dietary goals regarding behavioral change should be specific to direct attention and effort. Setting a goal that is tailored to the individual's prior experience, eating habits, and level of commitment in terms of perceived difficulty may facilitate greater dietary change. When setting an appropriately difficult goal regarding LGI foods, the establishment of 1–2 additional servings/day represents a reasonable level of difficulty; some individuals may prefer to set a goal of 1 additional serving/day while others may choose 2 additional servings/day based on existing eating habits. Then, goals can be revised based on success with goal attempts. Complex tasks, such as making food choices in various environmental contexts, should be divided into subtasks to increase efficacy beliefs. A relevant action plan raises self-efficacy and increases the likelihood of greater goal commitment and goal attainment.

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Table 1

Baseline demographic and diabetes characteristics of each treatment group.

Characteristic	**6 serving group (*n* = 15)**	**8 serving group (*n* = 20)**	***P*-value**
	%		
Female	60.0	70.0	0.72
Caucasian	80.0	95.0	0.29
Married	53.5	70.0	0.48
Bachelor's degree or higher	60.0	50.0	0.73
Employed full-time	80.0	85.0	1.00
Household income ≥$60,000/year	60.0	60.0	1.00
Received previous diabetes education	80.0	85.0	1.00
Self-monitor blood glucose	66.7	75.0	0.71
Characteristic	6 serving group (*n* = 15)	8 serving group (*n* = 20)	P-value
	Mean ± SD		
Age (years)	49.60 ± 6.67	52.55 ± 5.94	0.19
Diagnosed with diabetes (years)	6.40 ± 5.18	5.80 ± 3.61	0.70

Table 2

Within- and between-group comparisons of goal and dietary outcomes for the assigned goals.

Goal outcome	**Post goal assignment**		***P*-value[a]**	**Study end**		***P*-value[a]**	**Change score**		***P*-value[a]**
	6 svg. group (*n* = 15)	**8 svg. group (*n* = 20)**		**6 svg. group (*n* = 15)**	**8 svg. group (*n* = 20)**		**6 svg. group (*n* = 15)**	**8 svg. group (*n* = 20)**	
	Mean±SE			**Mean±SE**			**Mean±SE**		
Goal difficulty[b]	2.27±0.57	3.40±0.50	0.14	1.33±0.57	3.80±0.50	0.002	−0.93±0.64	0.40±0.55	0.12
Goal commitment[c]	4.64±0.14	4.44±0.12	0.31	4.50±0.14	4.09±0.12	0.03	−0.13±0.13	−0.36±0.11**	0.19
Goal satisfaction[d]	7.53±0.41	6.75±0.36	0.16	6.47±0.41	6.80±0.36	0.54	−1.07±0.43*	−0.05±0.37	0.06
Dietary outcome	Base line		*P*-value[a]	Study end		*P*-value[a]	Change score		*P*-value[a]
	6 svg. group (*n* = 15)	8 svg. group (*n* = 20)		6 svg. group (*n* = 15)	8 svg. Group (*n* = 20)		6 svg. group (*n* = 15)	8 svg. group (*n* = 20)	
	Mean±SE			Mean±SE			Mean±SE		
Energy (kcal)	2170.7±138.6	2275.5±120.1	0.57	1666.0±142.1	1827.1±122.3	0.39	−504.7±132.5***	−448.4±113.9***	0.75
Fruits (svg./1000 kcal)[e]	0.36±0.17	0.45±0.15	0.67	1.03±0.18	0.94±0.15	0.71	0.67±0.21**	0.49±0.18*	0.51
Vegetables (svg./1000 kcal)[f]	1.71±0.28	1.24±0.24	0.21	2.08±0.29	1.88±0.25	0.60	0.37±0.33	0.64±0.28*	0.55
Nuts and seeds (svg./1000 kcal)	0.37±0.27	0.45±0.23	0.81	0.75±0.27	0.87±0.23	0.74	0.38±0.20	0.42±0.17*	0.90
Dairy foods (svg/1000 kcal)[g]	0.78±0.17	0.74±0.15	0.85	1.27±0.17	0.80±0.15	0.04	0.48±0.13***	0.06±0.11	0.02
Whole grain pasta (svg./1000 kcal)	0.0±0.03	0.01±0.03	0.77	0.10±0.03	0.04±0.03	0.26	0.10±0.05	0.03±0.04	0.32
Total servings (per 1000 kcal)	3.22±0.47	2.90±0.41	0.61	5.27±0.48	4.55±0.41	0.26	2.05±0.47***	1.65±0.40***	0.52
Total servings	6.76±0.94	6.53±0.83	0.85	8.42±0.96	8.40±0.83	0.99	1.67±0.82*	1.88±0.70**	0.84
Glycemic index	61.66±1.12	61.11±0.97	0.71	55.04±1.16	56.50±0.99	0.34	−6.62±1.31***	−4.61±1.13***	0.25

[a]Between-group comparison at each assessment using contrasts based on repeated measures analysis of variance.

[b]Response options ranged from 0 = very easy to 8 = very difficult on a 1-item measure.

[c]Response options ranged from strongly disagree to strongly agree on a 5-point scale. Negatively stated items were reverse scored; a higher total score indicates greater commitment.

[d] Response options ranged from 0 = a great deal of dissatisfaction to 8 = a great deal of satisfaction on a 1-item measure.

[e] Excludes fruit juices.

[f] Excludes white potatoes.

[g] Includes whole, reduced and non-fat milk, cheese and yogurt.

* Significant within-group change from baseline using contrasts based on repeated measures analysis of variance, $P \leq 0.05$.

** Significant within-group change from baseline using contrasts based on repeated measures analysis of variance, $P \leq 0.01$.

*** Significant within-group change from baseline using contrasts based on repeated measures analysis of variance, $P \leq 0.001$.

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Table 3

Longitudinal changes within groups in self-efficacy for achieving a lower glycemic index diet.

Self-efficacy outcome	Base line Mean ± SE	Post-intervention Mean ± SE	Post goal assignment Mean ± SE	Study end Mean ± SE
Self-efficacy (total score)[a]				
6 serving group	6.94a ± 0.30	8.58b ± 0.30	9.28b ± 0.32	9.33b ± 0.32
8 serving group	7.10a ± 0.28	8.38b ± 0.27	9.14b ± 0.27	9.30b ± 0.28
GI efficacy subscale[b]				
6 serving group	6.40a ± 0.35	8.55b ± 0.35	8.98b ± 0.38	9.26b ± 0.38
8 serving group	6.71a ± 0.32	8.22b ± 0.31	8.77b ± 0.32	8.98b ± 0.33
Goal difficulty subscale[c]				
6 serving group	6.93a ± 0.38	8.54b ± 0.38	9.50b ± 0.40	9.31b ± 0.40
8 serving group	7.11a ± 0.35	8.30a ± 0.33	9.45b ± 0.34	9.47b ± 0.35
Negative food selection subscale[d]				
6 serving group	8.04a ± 0.36	8.76a ± 0.36	9.25a ± 0.39	9.52a ± 0.38
8 serving group	7.84a ± 0.33	8.88a ± 0.31	9.10a ± 0.32	9.46b ± 0.33

Means in a row with the same letters are not significantly different from each other using repeated measures analysis of variance with Tukey honestly significant difference test ($P > 0.05$).

[a] Response options ranged from 0 = strongly disagree to 10 = strongly agree.

[b] The mean score of 6 items.

[c] The mean score of 8 items.

[d] The mean score of 3 items. These items were reverse scored so a higher score represents greater efficacy beliefs.

Table 4

Pearson correlations among goal setting components and change in servings of low glycemic index (GI) foods consumed ($n = 35$).

Goal setting outcomes	Correlation coefficient
Goal difficulty following goal assignment and participant's individual goal	0.20
Goal difficulty and goal commitment following goal assignment	−0.52**
Goal difficulty and self-efficacy following goal assignment	−0.38*
Goal commitment and self-efficacy following goal assignment	0.59***
Goal satisfaction and self-efficacy at study end	0.36*
Self-efficacy following goal assignment and change in GI servings[a]	0.33
Goal commitment following goal assignment and change in GI servings[a]	0.26
Goal satisfaction at study end and change in GI servings[a]	0.01
Participant's individual goal at baseline and change in GI servings[a]	0.24

[a]Two participants were deleted from the analysis for change in GI servings due to illness and a low energy intake at study end.

*$P < 0.05$.

**$P < 0.01$.

***$P < 0.001$.