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Advance Quantity Meal Preparation Pilot Program Improves Home-Cooked Meal Consumption, Cooking Attitudes, and Self-Efficacy

Shannon Mendez, MS, RD; Jamie Kubota, MS, RD; Adrienne M. Widaman, PhD, RD; John Gieng, PhD

ABSTRACT

Objective: To evaluate the effects of a group-based *Advance Quantity Meal Preparation* (AQMP) program on the consumption of home-cooked meals, cooking attitudes, and self-efficacy in healthy adults.

Methods: Participants (n = 10) in a group setting prepared healthy meals weekly consisting of 10 entrees and 5 snacks for 6 weeks. A survey assessing cooking attitudes, cooking self-efficacy, and cooking behavior and consumption at 3 time points: preprogram, postprogram (T2), and 3 months postprogram (T3).

Results: The AQMP program increased the proportion of overall home-cooked meal consumption (T2, $P = 0.03$), home-cooked dinner consumption (T2, $P = 0.04$), cooking attitudes (T3, $P = 0.01$), and cooking self-efficacy (T2, $P = 0.002$).

Conclusions and Implications: This pilot study indicates that AQMP may increase home-cooked meal consumption, cooking attitudes, and cooking self-efficacy.

Key Words: meal, cooking, attitudes, group-based cooking program (*J Nutr Educ Behav.* 2021;53:608–613.)

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INTRODUCTION

Obesity is an epidemic linked with several noncommunicable diseases such as type 2 diabetes mellitus and heart disease.¹ In the US, the prevalence of overweight and obesity has steadily risen in recent decades.² Factors including the overabundance and availability of convenience foods, an increase in consumption of energy-dense foods from sources outside the home, and the decline in cooking skills and nutrition knowledge have contributed to this increase.^{1,3,4} Observational studies suggest that eating home-cooked meals more frequently was associated with lower body mass index (BMI) and body fat percentage and an overall healthier

diet.^{5–7} However, lack of time, nutrition knowledge, and cooking skills were barriers to cooking at home.⁶ Interventions that included hands-on cooking classes, nutrition education programs, or group classes focused on menu plans and portion control were reported to increase cooking skills, increase confidence with meal preparation, and reduce financial expenditure on takeaways or fast foods.^{8–11} Although these interventions evaluated cooking skills, cooking attitudes and behaviors, and cooking self-efficacy, there are limited data on programs or interventions that overcome the barrier of time constraint while promoting home-cooked meal preparation and consumption. Evidence suggests that commercially prepared

and preportioned meals in conjunction with counseling promoted sustained and significant weight loss.¹² Combining hands-on cooking with a pre-prepared meal intervention may have a positive effect on both cooking behaviors and health-related measures.

Advance quantity meal preparation (AQMP) is the process of planning and preparing meals in bulk, ahead of time, to eat later. The AQMP program was a 6-week group-based intervention designed to increase consumption of home-cooked meals by overcoming barriers, including lack of time. This program was also designed to increase cooking self-efficacy and promote positive and healthy cooking attitudes and behaviors.^{8,10,11,13} The goal of this program was to promote the long-term adoption of behaviors related to pre-preparing portioned meals to increase home-cooked meal consumption, which in turn may positively affect health outcomes. In the present pilot study, the primary aim was to determine whether this 6-week group-based AQMP program affected the consumption of home-cooked meals in healthy adults; the secondary aim was to determine whether the

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program affected cooking attitudes and cooking self-efficacy. It was hypothesized that this program would reduce barriers to consuming home-cooked meals and increase consumption of home-cooked meals.

METHODS

Study Design

The AQMP program was evaluated in a pre-experimental pilot study on healthy adult members of a fitness center in Santa Clara, CA, in early 2019. Program development focused on perceived barriers of home-cooking and self-efficacy related to cooking skills.^{8,10,11,13} The AQMP program addressed the barrier of perceived time constraints, which is one of the most widely reported barriers to home-cooked meal consumption.^{14,15} It did this by demonstrating that a large portion of weekly meal preparation can be consolidated into a concerted effort, using less overall time. Self-efficacy was also fostered by allowing the participants to practice new cooking skills each week in a socially supportive, group-based environment.

Participants met for 6 consecutive Sundays from 8 AM to 12 PM at a commercial kitchen, where the facilitator assigned various tasks (eg, chopping and trimming vegetables, preparing and cooking protein such as ground turkey, and baking) as needed for group-based AQMP. Collectively, the participants prepared, portioned, and packaged meals and snacks in bulk to be consumed during the following week. Each participant received 10 individually packed and portioned meals and 5 individual snacks per week. The facilitator suggested 1 portioned meal be consumed for each lunch and dinner during the 5-day work week. Participants were free to supplement with food and beverage *ad libitum* throughout the week and weekend. A program fee per week of \$100 covered food (\$46.89/person/wk), reusable food packaging containers (\$13.07/person), supplies (\$5.52/person/wk), and the kitchen rental/miscellaneous (\$45.41/person/wk). Each meal (mean \pm SD) contained an estimated 664 \pm 143 kcal, 59 \pm 16 g of carbohydrates, 43 \pm 14 g of protein, 29 \pm 10 g of fat, and 8 \pm 3 g of fiber,

and each snack contained 389 \pm 11 kcal, 33 \pm 3 g of carbohydrates, 15 \pm 0.2 g of protein, 24 \pm 0.05 g of fat, and 6 \pm 0.4 g of fiber. Before each meeting, the menus, recipes, and ingredients were designed and acquired by the program facilitator (S.M.), who holds a master's degree in nutritional science, has experience leading group classes, and has led AQMP programs in the past. Appropriateness for bulk preparation, available equipment, and likelihood for participant acceptance informed standardized recipes. In accordance with the Dietary Guidelines for Americans, 2015–2020,¹⁶ recipes emphasized lean meats, whole grains, and fruits and vegetables, in addition to low added sugar, sodium, and saturated fat. Cooking education included verbal instructions, demonstrations, and time-saving techniques. The program facilitator provided one-on-one skill demonstration, as needed. After the completion of the 6-week program, participants received copies of the recipes used and reusable food containers to help support AQMP behaviors and practices at home.

To determine if the AQMP program increased home-cooked meal consumption, participants were assessed preprogram (T1), postprogram (T2), and 3 months postprogram (T3).

Participants

Subjects were recruited using a convenience sampling strategy via email and social media posts from a fitness center in Santa Clara, CA. Participants were included if they were aged at least 18 years and could stand and work in a kitchen for 4 hours continuously without assistance. A maximum of 10 participants were included in the cohort because of kitchen space limitations. The San José State University Institutional Review Board approved the study protocol, and researchers obtained written consent from each participant before the commencement of the study.

Frequency of Home-Cooked Meal Consumption and Cooking Behaviors

A web-based survey (Qualtrics, Provo, UT) was administered at T1, T2, and T3 to collect self-reported home-

cooked meal consumption, cooking attitudes, cooking self-efficacy, and AQMP acceptance. Six home-cooking consumption questions were created *de novo* for this study and asked participants to report “in the past 30 days, how many times per week on average did you consume breakfast, lunch, and/or dinner” and “in the past 30 days, how many times per week on average did you consume a home-made breakfast, lunch and/or dinner.”

To measure cooking attitudes and self-efficacy, the survey asked 25 Likert scale questions from the validated Cooking With a Chef tool (unpublished data, Michaud P, “Development and Evaluation of Instruments to Measure the Effectiveness of a Culinary and Nutrition Education Program [master's thesis]” Clemson University, 2007).^{13,17} In addition, the survey assessed the frequency of AQMP by defining AQMP and asking, “in the past 30 days, how many times have you batch meal prepped?” Finally, to assess attitudes related to AQMP, 2 Likert scale questions were created *de novo*: “I am familiar with advance quantity meal prep techniques” and “I am confident utilizing advance quantity meal prep techniques.” The research team and 1 outside volunteer independently evaluated these questions for face validity.

Anthropometrics and Dietary Intake

To monitor a subset of health-related measures of the participants, researchers collected anthropometric and dietary composition data. At T1, T2, and T3 height were measured to the closest 0.1 cm using a stadiometer (model 213, Seca, Hamburg, Germany, 2014), weight to the closest 0.1 kg with a digital scale (model BF-522W, Tanita Corporation, Tokyo, Japan), and waist and hip circumference to the closest 0.1 cm with a measuring tape (model 201, Seca). Two program staff collected and confirmed each measurement at each time point. An InBody 570 Multifrequency Bioelectrical Impedance Analyzer (Biospace, Inc, Seoul, Korea) was used to estimate skeletal muscle mass, body fat mass, and body fat percentage. InBody is comparable,

$r=0.94$ ($P < 0.001$) to dual-energy x-ray absorptiometry to measure body composition.¹⁸

Participants used a computer-assisted dietary recall method, the Automated Self-Administered 24-hour dietary assessment tool (version 2018, National Cancer Institute, Bethesda, MD) to report dietary intake on 2 weekdays and 1 weekend day during each time point (T1, T2, and T3; a total of 9 recalls).¹⁹ These data were used to assess energy and macronutrient intake at each time point and were compared within-subject.

Data Analysis

The primary outcome measured in this study was the proportion of home-cooked meals consumed. The percentage of home-cooked meals consumed was calculated on the basis of the self-reported number of home-cooked meals divided by the self-reported total number of meals and for breakfast, lunch, or dinner. The secondary outcomes included cooking attitudes and cooking self-efficacy. Survey data for the cooking attitudes and cooking self-efficacy were coded and scored as described elsewhere (Michaud P, unpublished data "Development and Evaluation of Instruments to Measure the Effectiveness of a Culinary and Nutrition Education Program," Thesis, Clemson University, 2007). Dietary recalls were reviewed and cleaned per Automated Self-Administered 24-hour guidelines based on the 5th and 95th percentile of intakes for energy and specific nutrients.²⁰ Two recalls were omitted on the basis of these guidelines. Because of the small sample size, this study did not meet the sample size guidelines for parametric tests. In addition, this study had a repeated measures design with the same individuals. Therefore, a Friedman's 2-way ANOVA test of differences by ranks was used as a non-parametric version of 1-way repeated measures ANOVA and reported as a chi-square value to test for statistical significance ($P \leq 0.05$) among any of the 3-time points (T1, T2, and T3) (IBM SPSS Statistics for Mac, version 26, IBM Corp, Armonk, NY, 2019). If this test showed significance, a pairwise *post hoc* Dunn test was

subsequently performed to determine if any 2 specific time points were significantly different at $P \leq 0.05$.

RESULTS

A total of 10 subjects (aged 46 ± 11 years) participated in and completed the study, with a majority being female (90%). All were unmarried and had some college or technical school education.

Sixty percent of participants were White, not of Hispanic origin, 30% were Asian or Pacific Islander, and 10% were Hispanic/Latino. The majority were employed full-time (90%), had a mean BMI of 31.7 ± 9.4 kg/m², and self-reported being overweight by at least 5–10 pounds (90%). Additional anthropometric and mean dietary intake data throughout the study period are reported in the Table. To determine whether AQMP affected the proportion of consumption of home-cooked meals, the percent consumption of home-cooked meals was calculated in total, and for breakfast, lunch, or dinner, and then assessed by nonparametric ANOVA. Percent consumption of total home-cooked meals among the 3 time points differed ($\chi^2[2]=7.29$, $P=0.03$), with an increase from T1 ($54 \pm 29\%$) to T2 ($89 \pm 8\%$) ($P=0.03$). Differences in percent consumption of home-cooked dinners were also seen among the 3-time points ($\chi^2[2]=7.80$, $P=0.02$), with an increase in percent consumption of home-cooked dinners between T1 and T2 ($P=0.04$) as shown in the Table.

Advance quantity meal preparation frequency ($\chi^2[2]=5.87$, $P=0.05$), familiarity ($\chi^2[2]=12.19$, $P=0.002$), and confidence ($\chi^2[2]=10.83$, $P=0.004$) changed in response to the AQMP program. Specifically, AQMP frequency increased from 3.3 ± 4.9 sessions in the past 30 days at T1 to 7.1 ± 6.0 sessions in the past 30 days at T2, then decreased back to 5.4 ± 5.9 sessions in the past 30 days at T3 ($P=0.05$). Moreover, there were increases from T1 to T3 in both familiarity ($P=0.01$) and confidence ($P=0.02$) reported by the participants when using AQMP techniques. In addition, the program led to differences among the 3 time points for overall cooking attitudes ($\chi^2[2]=8.67$, $P=0.03$) and

overall cooking self-efficacy ($\chi^2[2]=12.13$, $P=0.002$) (Table). Overall cooking attitude scores increased from T1 (77.6 ± 10.2) to T3 (85.3 ± 12.6) ($P=0.01$) and overall cooking self-efficacy scores increased from T1 (28 ± 3.6) to T2 (31.8 ± 3.7) ($P=0.008$).

DISCUSSION

This pilot study evaluated the effects of the group-based AQMP program on home-cooked meal consumption, cooking attitudes, and cooking self-efficacy. The results confirmed the hypothesis that a group-based AQMP strategy shows potential to increase home-cooked meal consumption and improve cooking attitudes, skills, and self-efficacy. Increases were seen in home-cooked meal consumption for total meals and dinners from pre-program to postprogram. Cooking attitudes and self-efficacy also increased postprogram. To the authors' knowledge, this is the first study to evaluate a program focused primarily on batch prep cooking. A quasi-experimental, longitudinal evaluation of a general cooking skills program found similar results with an increase in cooking confidence and a decrease in take-away/fast food purchases preprogram and post a 10-week program.^{8,13} Home-cooked breakfast consumption increased, although not significantly, despite the AQMP program not providing breakfast for the participants. This finding may be attributed to increased motivation to eat more home-cooked meals as a by-product of the AQMP program, as observed in other group-based cooking studies.^{8,10,13} It is also possible that the participants consumed their prepared AQMP meals for breakfast rather than for lunch or dinner.

When designing group-based nutrition programming, consider including advanced quantity meal preparation to improve cooking behaviors.

The greatest changes in cooking attitudes were related to the effort and energy required to cook. Participants

Table. Home-Cooked Meal Consumption Rates, Cooking Attitudes and Self-Efficacy, Anthropometrics, and Energy and Macronutrient Intake in Healthy Adults Enrolled in a 6-Week Group AQMP Program (n = 10)

Variable	Preprogram (T1)		Postprogram (T2)		3 Months Postprogram (T3)		$\chi^2(2)$
	Mean	SD	Mean	SD	Mean	SD	P value ^a
Home-cooked meal consumption proportion (%)							
Breakfast	70	36	76	43	87	31	0.09
Lunch	42	35	92	10	69	32	0.052
Dinner	52*	29	86*	14	70	30	0.02
Total meals	54*	29	89*	8	76	29	0.03
Cooking behavior							
Cooking attitudes score ^b	77.6*	10.2	76.2	19.8	85.3*	12.6	0.01
Cooking self-efficacy score ^c	28.0*	3.6	31.8*	3.7	31.3	4.2	0.002
Anthropometrics							
Weight (kg)	85.1*	27.8	83.6	27.4	83.3*	27.4	0.03
Waist-to-hip ratio	0.89	0.07	0.85	0.07	0.86	0.08	0.04
Skeletal muscle mass (kg)	29.6	5.3	29.8	5.4	29.3	5.4	0.41
Body fat mass (kg)	32.0***	21.6	30.3*	21.4	28.6**	22.4	0.01
Body fat (%)	34.8	11.0	33.6	11.9	33.9	12.0	0.08
Body mass index (kg/m ²)	31.7*	9.4	31.1*	9.3	31.0	9.4	0.03
Energy and macronutrient intake							
Energy intake (kcal)	1,646.7	626.7	1,574.0	366.6	1,708.2	655.2	0.72
Estimated energy requirement (% intake)	66.9	35.0	73.2	23.9	77.8	28.0	0.67
Protein intake (g)	82.6	17.8	106.6	28.7	98.5	39.5	0.12
Fat intake (g)	73.0	27.0	62.3	25.8	66.6	30.7	0.37
Carbohydrate intake (g)	163.1	98.8	147.6	42.7	159.1	77.1	0.72

AQMP indicates advance quantity meal preparation.

^aA nonparametric Friedman test of differences on the basis of ranks was performed and reported as a chi-square value because of the small sample size and to account for repeated measures. A pairwise *post hoc* Dunn test was performed when the Friedman test was statistically significant at $P \leq 0.05$ to determine whether there were differences between time points;

^bCooking Attitude scores range from 20 (negative) to 100 (positive); ^cCooking Self-Efficacy scores range from 7 (low) to 35 (high).

Note: Groups with common superscript asterisks are significantly different on the basis of the pairwise *post hoc* Dunn test at $P \leq 0.05$.

in this study spent 4 h/wk on AQMP, whereas Americans involved in meal preparation report spending an average of 7 h/wk on meal preparation and clean-up.²⁰ This result indicates that AQMP may help overcome the lack of time as a barrier to preparing home-cooked meals.

Sustained changes in cooking behaviors are of interest. The overall attitudes of participants toward cooking increased, as well as familiarity, confidence, and use of AQMP 3 months after program completion. These findings are similar to other studies that examined cooking attitudes, reporting a more positive attitude toward cooking after completing a nutrition and cooking program.^{8,13,21} A 10-week community cooking skills program reported sustained attitudes and knowledge around cooking from baseline to 6 months postprogram.¹³ In addition,

2 studies that used the same cooking behavior assessment measure as this study, the Cooking With a Chef tool, reported significant increases in cooking self-efficacy,^{10,21} and 1 pilot study reported positive shifts in cooking attitudes from precourse to postcourse.²¹ Self-efficacy of the participants in the present study increased, suggesting a gain in cooking skill confidence during the course of the program.

Developing cooking skills that include bulk meal prep may be an effective strategy to overcome barriers to home-cooked meal consumption.

Nutrition education programs that incorporate cooking instruction

have improved cooking behaviors and attitudes in lower-income populations.²² Given the potential for meal prepping to reduce cooking costs, further research is warranted to determine the efficacy of AQMP programming focusing on low-cost recipe ingredients and minimal equipment. Recipes used in this AQMP program included steak, shrimp, and chicken breast as protein sources. Focusing on less expensive protein sources could lower food costs to target lower-income populations in future research. The AQMP program rented commercial kitchen space to accommodate 12 individuals. This additional cost may be minimized in facilities with established teaching kitchens.

Some limitations of this study included not having a control group and self-selection, thus not allowing

for causal inferences. Participants were active members at a fitness center who were able to spend 4 hours and \$100/wk to participate in a cooking-related study. Although not measured, the motivation to change behaviors related to health and their socioeconomic status was higher than the general population. The survey, as a whole, was not validated beyond face validity. Energy needs were not considered when portioning meals, exemplary menus for diet quality were not used, and *ad libitum* food and beverage intake was allowed. The program facilitator procured all food and supplies, and therefore, participants did not have to practice food resource management skills such as meal planning, making lists, and grocery shopping. These steps could be a deterrent to AQMP at home. However, the 3 months postprogram results represented participants planning and acquiring food and supplies themselves. Finally, there was no power analysis and the small sample size of this study may have limited statistical power to detect sustained effects of AQMP on home-cooked meal consumption and cooking behaviors.

IMPLICATIONS FOR RESEARCH AND PRACTICE

To the authors' knowledge, this was the first study to examine the effects of AQMP on healthy adults. The results suggest the potential of AQMP as a strategy to increase the frequency of consumption of home-cooked meals and increase positive cooking attitudes and cooking self-efficacy. With proper controls and a larger sample size, future research could confirm and build evidence for the efficacy of nutrition interventions that include AQMP as a strategy to overcome barriers to cooking and eating away from home.

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