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Knowledge and Attitude of Nigerian Undergraduates on Healthy Diet: Outcome of a Nutrition Education and Mobile Phone Communication Intervention

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Abstract

Undergraduates may lower their risk of developing chronic non-communicable diseases (NCDs) such as; diabetes, cardiovascular diseases, and cancer which are consistently among the top eight leading causes of death globally by improving their nutrition knowledge and attitude towards nutrition. The study evaluated the effect of nutrition education and mobile phone communication intervention on undergraduates' knowledge and attitude of a healthy diet in Oyo-state, Nigeria.

This study employed a quasi-experimental research design among 100 undergraduate students selected through a multistage sampling technique from four universities. There were four groups: control, nutrition education alone, mobile phone communication alone, and nutrition education and mobile phone communication intervention. An 8-week follow-up was done after the study implementation. Data were analysed using descriptive and inferential statistics to test the effectiveness of the interventions. All statistical tests were at 5% level of significance.

All the respondents were single (100%). Mean age of respondents was 19.80 ± 2.22, knowledge about healthy diet and attitude towards healthy diet among respondents in all four groups at baseline was poor. A combination of the nutrition education and mobile phone communication intervention exhibited significant increase in the respondents' knowledge of healthy diet by 19.93% from baseline (13.91 ± 3.48) to endline (19.69 ± 2.73), with a big level of effect (ES = 0.602), this is the highest effect size of all the groups. Mobile phone communication alone had the highest increase in attitude mean score by 20.33%.

A combination of educational program with reminder strategies improves knowledge retention and attitude of respondents.

Keywords*: Knowledge, Attitude, Healthy diet, Undergraduates, Intervention, Nigeria.*

Introduction

Healthy eating practices and lifestyle play a key role in the prevention of chronic non-communicable diseases (NCDs) such as; diabetes, cardiovascular diseases, cancer, and stroke which are consistently among the top eight leading causes of death globally. A healthy diet consists of intake from a variety of nutrient-dense foods, including; fruits, vegetables, legumes, nuts, and whole grains; it is also characterized by a low intake of energy-dense foods but high in sugar, salt, and fat (1). Healthy eating and sound nutritional practices are cornerstones of good health as they help to protect against all forms of malnutrition.

Young adults in the university are vulnerable in their eating habits for various reasons which include their deficiency in knowledge about what constitutes healthy food that could influence their eating habits (2). Financial aspects might also play a role, as fats and sweets cost less, whereas many healthier foods cost more, and students also face academic responsibilities that may generate stress and lead to changes in eating habits (3). In addition, students' eating behaviour could be affected by university characteristics such as students' societies, university lifestyle and exams, and by the institution's nutrition environment and its contribution to the adoption of healthy/unhealthy eating habits.

Many factors have been reported to influence the unhealthy eating practices of young adults, which include individual and environmental factors (4). Among the individual factors are; dietary knowledge and attitude (5), which

positive correlation has been reported to exist between dietary knowledge (6), dietary attitude (7) and eating habit, indicating that the more knowledgeable and the more positive the attitude of youths are with regard to healthy eating, the better their eating habits. Another study (8) also found out that the personal factors are hectic lifestyles (leaving little time for shopping and cooking), taste preferences, negative attitudes and perceived norms regarding healthy eating, and lack of knowledge, skills, self-efficacy, and social support. Studies have also shown that one major reinforcing factor contributing to the unhealthy dietary practice of young adults is peer influence (9-10).

Several factors had been identified to be associated with the poor eating behaviour and inadequate dietary intake of Nigerian students, which include; their level of knowledge and perception about the health benefits of nutrition, level of physical activities, significant others, social norms and beliefs, environmental factors (availability and affordability, food cost) and attitudinal disposition (11). Nonetheless, universities especially government-owned institutions and other private schools that do not provide food for their students provide appropriate opportunities/environment to reach many young adults through nutrition education efforts to positively influence their dietary intakes and encourage them to embrace healthy food choices, as the number of students enrolled in higher education worldwide will reach 262 million by 2025, a marked increase from 178 million in 2010 (12).

Hence, if nutrition education and policies that are operational are not put in place among the university students in Nigeria, there may be an upsurge of diet related health problems in the nearest future. Therefore, the study evaluated the effect of nutrition education and mobile phone communication intervention on undergraduates' knowledge and attitude of healthy diet in Oyo-state, Nigeria.

Methods

This study employed a quasi-experimental design (quantitative method), comprising of three experimental groups and one control group (Experimental group 1: Nutrition Education and Mobile Phone Communication (NE & MPC); Experimental group 2: Nutrition Education alone (NE alone); Experimental group 3: Mobile Phone Communication alone (MPC alone). This study evaluated the effect of nutrition education and mobile phone communication intervention on knowledge and attitude of undergraduate students in four randomly selected tertiary institutions in Oyo state (Lead City University, Ibadan; University of Ibadan, Ibadan; Ajayi Crowther University, Oyo and Ladoke Akintola University of Technology, Ogbomoso).

Sample size determination

There was no given estimate of the prevalence of the eating practice of university students in Oyo-state, thus, the sample size was determined using Power formula for computation of sample size. This sample size is just for one population (one university), therefore the total size was multiplied by four to get the total sample size for all the targeted population in the four selected universities.

$$n = \frac{(Z_\alpha + Z_\beta)^2 \times P_0(1 - P_0)}{(P_1 - P_0)^2}$$

Z_α = 95% confidence interval i.e 1.96

Z_β = 80% i.e 0.84 (Power to detect changes in the outcome variable and avoid type II error)

P_0 = prevalence (at 50%)

P_1 = 80% (desired level of outcome variable i.e adherence to healthy eating practices)

$$n = \frac{(1.96 + 0.84)^2 \times 0.5(1 - 0.5)}{(0.8 - 0.5)^2}$$

$$\frac{(2.8)^2 \times 0.5(0.5)}{(0.8 - 0.5)^2}$$

$$\frac{7.84 \times 0.25}{0.09}$$

$$= 21.78 \simeq 22$$

The minimum sample size is 22.

10% of the minimum sample size was added to take care of attrition.

The total number of participants after adding 10% of 22 was = 22 + 2.2 ≃ 25

Based on this computation a total number of 100 participants (25 X 4) from the four universities was enrolled for this study (representing 25 people per group)

Sampling technique

A list of universities in Oyo state was obtained from the state ministry of education, science and technology. First, stratified sampling technique was use to select the two government and two private universities for this study in Oyo state. By simple random sampling technique using the balloting method among the nine schools given,

Ajayi Crowther University, University of Ibadan, Lead City University, and the Ladoke Akintola University of Technology was selected. Secondly, the selected universities were then randomly assigned to either an experimental or control group.

Stage two: Selection of respondents'

Postal advertisement and flyers were circulated around the schools selected to recruit respondents for this study. Interested participants were screened to know if they are eligible for the study. In order to make sure that each gender was fully represented in the study, the participant was selected by means of non-probability method using convenience sampling technique. In each group the first 12 males or 13 females that meet the inclusion criteria were recruited for this study and vice versa. The advertisement contained the following information:

1. The name and address of the researcher;
2. A summary of the purpose of the research;
3. Basic eligibility criteria;
4. The benefit of participating in the research;
5. The time or other commitment required of the participant;
6. The name and phone number of the person to contact for further information.

Study implementation and instrument

This study was implemented in three phases: Baseline survey/data collection, Intervention, and Evaluation: follow up evaluation. A quantitative data collection instrument was used for data collection. Instrument was developed using information gathered from review of literature. The instrument was sectioned as follows:

Section A: The socio-demographic characteristics of the participants that are relevant to the study which includes the age, gender, marital status, religion, ethnicity, etc.

Section B: Nutrition and healthy diet knowledge. The section consists of 16-dictomous and 2 multiple choice questions measured on a 29-point rating scale. The dictomous was measured on Yes or No response, whereby Yes is represented as 1 and No as 2.

Section C: attitudinal dispositional of respondents towards a healthy diet. This variable consists of eight likert questions measured on a 24-point rating scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The scale was represented as Strongly Agree (SA) as 1, Agree (A) as 2, Disagree (D) as 3, and Strongly Disagree (SD) as 4.

Validity and reliability of an instrument

To ascertain the reliability of the instrument, a pilot-test was first conducted for internal consistency of the instrument using 10% of the total projected sample size (10 undergraduate students) from Olabisi Onabanjo University Ogun-state. Thereafter, a test re-test was conducted for the reliability of the instrument also using 10% of the anticipated sample size (10 undergraduate students) from Olabisi Onabanjo University Ogun-state. It was ensured that the sample for both the pilot-test and test-retest had the same characteristics as the study population.

The data from the test-retest was statistically analysed using Cronbach alpha standard score to test its reliability. After necessary adjustment, the Cronbach values were found to be between 0.70 and 0.81 for all the constructs in the questionnaire which shows good fit of the instrument.

Baseline data collection

The baseline data in this study in the first instance served as a measure to obtain data for both dependent and independent variables before the programme was implemented so that it may be used to compare with the post-intervention values. It was ensured that certain information gathered during the baseline phase was used to strengthen the contents of the nutrition education intervention. Baseline data was collected from participants in the four organized schools involved in the study using the instrument designed.

Outcome evaluation

At the 8th week follow-up, a second data collection was carried out to measure the outcome of the intervention particularly with respect to attitude, nutrition knowledge and what constitutes a healthy diet.

The three intervention groups were measured to determine which of the three; nutrition education and mobile phone communication, nutrition education alone, and mobile phone communication alone had a better outcome in increasing respondents' knowledge and attitude.

Development of training curriculum

The manual focused on the three intervention groups, has six modules for classroom instruction, and content of the mobile phone communication was gotten from the classroom instruction manual.

Classroom instruction intervention

Module I: (i) Why nutrition matters (ii) The relationship between diet and health (iii) The food guide pyramid

Module II: (i) Nutrients and their food sources (ii) Meaning of healthy balanced diet (iii) Diet diversity

Module III: (i) Healthy dietary practices (ii) Meaning and component of healthy eating (iii) Importance of breakfast, lunch and dinner

Module IV: (i) Relationship between disease and nutrition (ii) Detrimental effects of sugary foods and drinks (iii) hazards of fast food

Module V: (i) Finding and choosing healthy foods (ii) Daily dietary needs for young adults (iii) Body image dissatisfaction

Module VI: (i) Importance of fruits and vegetables and improving fruits and vegetable consumption (ii) barriers to fruits and vegetable consumption (iii) Meaning of food safety (iv) Hygiene practices during meal preparation and safeguarding of food

Mobile communication interventions

The healthy eating tips text messages (GO NOURISH) was based on packages from the classroom instructions (messages on healthy choices when eating out, the food guide pyramid, nutritional needs of young adults, hazards of fast food, and hygiene practices during preparation and safeguarding of food) was prepared and edited before final dissemination.

These text messages were sent between the hours of 4:00 am and 5:00 am to ensure that the participant adhered to good nutrition before eating during the day. The calculation was for them to wake up in the morning to read their healthy eating messages before commencing the day's activities in order for them to make good nutrition choices.

Intervention details

There were three experimental groups for this study:

Experimental Group I (Nutrition Education intervention and Mobile phone communication for healthy eating practice) NE & MPC

The first intervention focused on nutrition education and mobile phone communication in form of a conventional lecture and social support incorporating healthy eating tips which served to enhance self-efficacy, provide alert to adhere to good nutrition practices. The content in the training curriculum was used to produce some of the text messages that was sent out.

Mode of intervention administration

This group received both nutrition education and mobile phone communication intervention simultaneously. All participants were assigned numbers which were the only form of identification. The researcher facilitated the program with the use of the manual developed for the training. Each session was conducted every Sunday between 1 pm to 2.30 pm for a period of six weeks. The intervention lasted for 6 weeks between October-November 2019.

Experimental Group II (Nutrition education intervention) NE alone

The second intervention focused on nutrition education alone which was delivered in the form of a conventional lecture for 90 minutes, once a week for six weeks

Mode of intervention administration

This group received only the nutrition education intervention and also participants were assigned numbers which was the only form of identification. The researcher facilitated the program with the use of the manual developed for the training. Each session was conducted every Saturday between 10-11.30am for a period of six weeks. During the baseline data collection, all the participants in this group were told to write down their phone number where they would want to receive the text messages. The healthy eating tips text messages was based on packages from the classroom instructions (messages on healthy choices when eating out, the food guide pyramid, nutritional needs of young adults, hazards of fast food, and hygiene practices during preparation and safeguarding of food etc.) and was prepared

and edited before final dissemination. The content was grouped into three categories each per week for the text message to serve as a reminder to participants to engage in health-enhancing behaviour which was titled GO NOURISH. The text messages were sent using the bulk SMS platform and were sent every Monday, Wednesday, and Friday between 4-6 am to ensure that the participant will adhere to good nutrition before eating during the day. The calculation was for them to wake up in the morning to read their healthy eating messages before commencing the day's activities in order for them to make good nutrition choices. The intervention lasted for 6 weeks between October-November 2019

Experimental Group III (Mobile phone communication for healthy eating practice) MPC alone

The third intervention focused on mobile phone communication for healthy eating practice alone which was delivered in the form of an alert on healthy eating tips.

Mode of intervention administration

This group received only the mobile phone communication intervention. During the baseline data collection, all the participants in this group were told to write down their phone number where they would want to receive the text messages. The healthy eating tips text messages was based on packages from the classroom instructions (messages on healthy choices when eating out, the food guide pyramid, nutritional needs of young adults, hazards of fast food, and hygiene practices during preparation and safeguarding of food etc) and was prepared and edited before final dissemination. The content was grouped into three categories each per week for the text message to serve as a reminder to participants to engage in health-enhancing behaviour which was titled GO NOURISH. The text messages were sent using the bulk SMS platform and were sent every Monday, Wednesday and Friday between 4-6 am to ensure that the participant will adhere to good nutrition before eating during the day. The calculation was for them to wake up in the morning to read their healthy eating messages before commencing the day's activities in order for them to make good nutrition choices. The intervention lasted for 6 weeks between October-November 2019.

Two months after the intervention, the follow-up data was collected to determine the effect of the interventions

Data analysis

The data obtained from completed questionnaires were collated and analysed using Statistical Package for Social Science (SPSS) version 23.0. Data that were entered and subjected to descriptive (i.e frequency, percentage, means, standard deviation, standard error) and inferential (i.e t-test, ANOVA) statistical analyses with the significance level set at $p=0.05$.

Ethical consideration

This study obtained ethical approval from Babcock University Health Research and Ethics Committee (BUHREC) with reference number BUHREC492/19 and Oyo State Ethics Review Committee under the Ministry of Health, Department of Planning, Research and Statistics Division with reference number AD/13/479/1486. Permission to conduct the study was also obtained from the dean of students' affairs in the various universities used for this study. All persons used for this study were informed that their participation is voluntary and informed consent was sought from all participants prior to their participation. Confidentiality of participants was maintained as no personal identifying information was collected on the questionnaire. Special care was taken to ensure that there was no false compensation or inducement as a means of recruitment or as a way of keeping the study respondents in the study.

Results

Demographic characteristics of study population

There were 100 respondents recruited for this study with a mean age of 19.80 ± 2.22, however, there were 94 respondents at the follow-up stage of the study, indicating a 6% loss to follow-up. Across both levels, the majority of the respondents were of Christian religious belief (Baseline: 85%; Endline: 81.9%) (See Table 1).

Knowledge

At baseline, the knowledge of respondents on nutrition and healthy eating was measured on a 29-point knowledge scale. At baseline, the mean knowledge score for Control group was 14.34 ±

3.17, the NE&MPC group was 13.91 ± 3.48, the NE alone group was 14.37 ± 2.94 and the MPC alone group was 14.45 ± 2.82. At endline, the mean knowledge score for Control group was 14.04 ± 2.97, the NE&MPC group was 19.69 ± 2.73, the NE alone group was 19.75 ± 3.36 and the MPC alone group was 17.25 ± 2.67. There is a significant difference in the level of knowledge across the baseline and endline levels in the experimental groups (NE&MPC: p=0.00; NE alone: p=0.00 and MPC alone p=0.003) (See Table 2).

Impact evaluation at baseline and endline for the control group and three experimental groups was carried out (NE&MPC, NE alone, and MPC alone). In the control group, there was no significant difference in the level of knowledge (p=0.695) across the baseline (14.34 ± 3.17) and endline (14.04 ± 2.97). In the NE&MPC experimental group, there was a significant increase in the respondents' knowledge of healthy eating by 19.93% from baseline (13.91 ± 3.48) to endline (19.69 ± 2.73), with a big level of effect (ES = 0.602). Using nutrition education alone resulted in a 18.55% increase in respondents' knowledge of healthy eating from 14.37 ± 2.94at baseline to 19.75 ± 3.36 at endline with a big level of effect (ES = 0.593). Mobile phone communication intervention in isolation resulted in a 9.66% increase in the knowledge of healthy eating from 14.45 ± 2.82 at baseline to 17.25 ± 2.67 at endline with a level of effect (ES = 0.321) (See Table 3).

Attitude

At baseline, the attitudinal disposition of respondents towards healthy diet was measured on a 24-points rating scale. At baseline, the mean attitude score for Control group was 12.00 ± 4.82, the NE&MPC group was 13.21 ± 5.00, the NE alone group was 12.58 ± 4.71and the MPC alone group was 10.41 ± 5.83. At endline, the mean attitude score for Control group was 11.60 ± 5.12, the NE&MPC group was 17.60 ± 2.91, the NE alone group was 15.37 ± 2.88 and the MPC alone group was 15.29 ± 2.89. There is a significant difference in the level of attitude across the baseline and endline levels in the experimental groups (NE&MPC: p=0.03; NE alone: p=0.016 and MPC alone p=0.001) (See Table 4).

Impact evaluation at baseline and endline for the control group and three experimental groups was carried out (NE&MPC, NE alone and MPC alone). In the control group, there was no significant difference in the level of attitude (p=0.827) across the baseline (12.00 ± 4.82) and endline (11.60 ± 5.12). In the NE&MPC experimental group, there was a significant increase in the respondents' attitudinal disposition towards healthy eating by 18.29% from baseline (13.21 ± 5.00) to endline (17.60 ± 2.91), with a level of effect (ES = 0.330). Using nutrition education alone resulted in a 11.62% increase in respondents' attitude towards healthy eating from 12.58 ± 4.71 at baseline to 15.37 ± 2.88 at endline with a level of effect (ES = 0.227). Mobile phone communication intervention in isolation resulted in a 20.33% increase in attitude towards healthy eating from 10.41 ± 5.83 at baseline to 15.29 ± 2.89 at endline with a level of effect (ES = 0.382) (See Table 5).

Discussion

Findings from this study showed that knowledge and attitude about health eating among respondents in all four groups at baseline was poor. The poor knowledge and attitude displayed by respondents was however unexpected just as there was equal representation of both male and female gender, a study [13] suggested a higher nutrition knowledge and attitude among respondents, establishing a higher knowledge and attitude among female than male, this also similar to study [14] where female students exhibited a higher level of knowledge and attitude on nutrition than male. This study highlighted poor nutrition literacy of respondents on the elements of a healthy diet and healthy eating habit, a phenomenon was further propounded [15] that found that more than half of students didn't know the source of vitamin B12 and iron neither knew the food group that should be eaten the least nor the foods that contain more fibers or calcium.

Sources of information and students' study field have been established to influence students' knowledge on the subject matter [15], while this study may not have assessed this influence, it comes at a high likelihood that respondents' poor knowledge of nutrition is attributable to this factor.

Expectedly, at the endline, there was an improvement in knowledge and attitude in the intervention groups except for the control group. This is similar to findings [16] which reported a substantial increase in nutrition knowledge and

attitude within the intervention group, indicating improvements in the ability to identify food groups an 8-month in-school, feasibility/pilot study, establishing the viability of the nutrition education intervention. Contrary to this however was a study [17] where no significant improvements in nutrition knowledge was found, owing to high score at the beginning and end of the intervention. In another contrary finding to this study, [18] also after an intervention recorded no significant increase in nutrition knowledge and attitude.

The variation in the intervention effect is, however, attributable to the context and content of these interventions, this study poses a superior theoretical framework conceptualization with the use of PRECEDE-PROCEED and a combination of two interventions, compared to studies [17-18] using Social Cognitive Theory.

It has been established that young adults face a high level of academic and social stress while at the university, this motivates them to participate in risky behaviours, such as alcohol, drug use, and unhealthy dietary practices. The transition period from adolescence to adulthood is critical for the development of lifelong healthy eating attitudes and practices, as the university environment definitively offer opportunities to improve the dietary intake through nutrition education interventions. Findings of this study revealed the nutrition education intervention strategies can improve knowledge and students' attitude towards healthy eating. Furthermore, the intervention can provide tools which are relevant for policymakers, researchers, parents, health care professionals and planners to develop health education programs that address the factors affecting healthy eating practices.

Conclusion

Table 1. Socio-demographic Characteristics of Respondents

Demographics Characteristics	Baseline		Endline (8-week follow up)	
	No.	%	No.	%
Age*				
Less than 19 years	52	52.0	35	37.2
19 years and above	48	48.0	59	62.8
Sex				
Female	51	51.0	45	47.9
Male	49	49.0	49	52.1
Marital status				
Single	100	100.0	94	100
Religion				
Christianity	85	85.0	77	81.9
Islam	15	15.0	14	14.9
Academic level				
100 level	32	32.0	28	29.8
200 level	20	20.0	24	25.5
300 level	15	15.0	20	21.3
400 level	29	29.0	19	20.2
500 level	4	4.0	3	3.2
Ethnicity				
Yoruba	65	65.0	60	63.8
Igbo	12	12.0	19	20.2
Hausa	4	4.0	1	1.1
Others	19	19.0	14	14.9
Residency				
Hostel	85	85.0	84	89.4
Town	15	15.0	10	10.6

Table 2. Paired Sample T-test analysis showing the level of knowledge of respondents on healthy diet between baseline and 8 weeks' follow-up

Variables	Groups	Timeline	Mean ± SD	t	df	P-value
Level of Knowledge	NE&MPC	Baseline	13.91 ± 3.48	5.772	22	0.000
		Endline	19.69 ± 2.73			
	NE alone	Baseline	14.37 ± 2.94	5.790	23	0.000
		Endline	19.75 ± 3.36			
	MPC alone	Baseline	14.45 ± 2.82	3.296	23	0.003
		Endline	17.25 ± 2.67			
	Control	Baseline	14.34 ± 3.17	0.397	22	0.695
		Endline	14.04 ± 2.97			

Table 3. Impact evaluation of intervention on knowledge between baseline and 8 weeks-follow up

Group	Baseline		8 weeks-follow up		*ES (95%CI)	p-value
	$\bar{x}$ (SE)	SD	$\bar{x}$ (SE)	SD		
Control	14.34 (0.66)	3.17	14.04 (0.62)	2.97	0.007 (-1.284 to 1.893)	0.695
NE&MPC	13.91 (0.72)	3.48	19.69 (0.57)	2.73	0.602 (-7.860 to -3.705)	0.000
NE alone	14.37 (0.60)	2.94	19.75 (0.68)	3.36	0. 593 (-7.295 to -3.455)	0.000
MPC alone	14.45 (0.57)	2.82	17.25 (0.54)	2.67	0.321 (-4.5445 to -1.040)	0.003

Table 4. Paired Sample T-test analysis showing the level of attitude of respondents towards healthy diet between baseline and 8 weeks' follow-up

Variables	Groups	Timeline	Mean ± SD	t	df	P-value
Level of Attitude	NE&MPC	Baseline	13.21 ± 5.00	3.294	22	0.003
		Endline	17.60 ± 2.91			
	NE alone	Baseline	12.58 ± 4.71	2.597	23	0.016
		Endline	15.37 ± 2.88			
	MPC alone	Baseline	10.41 ± 5.83	3.771	23	0.001
		Endline	15.29 ± 2.89			
	Control	Baseline	12.00 ± 4.82	0.221	22	0.827
		Endline	11.60 ± 5.12			

Table 5. Impact evaluation of intervention on attitude between baseline and 8 weeks-follow up

Group	Baseline		8 weeks-follow up		*ES (95%CI)	p-value
	$\bar{x}$ (SE)	SD	$\bar{x}$ (SE)	SD		
Control	12.00 (1.01)	4.82	11.60 (1.06)	5.12	0.002 (-3.280 to 4.062)	0.827
NE&MPC	13.21 (1.04)	5.00	17.60 (0.60)	2.91	0.330 (-7.156 to -1.626)	0.003
NE alone	12.58 (0.96)	4.71	15.37 (0.58)	2.88	0. 227 (-5.016 to -0.568)	0.016
MPC alone	10.41 (1.19)	5.83	15.29 (0.59)	2.89	0.382 (-7.549 to -2.201)	0.001

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