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The personal shopper – a pilot randomized trial of grocery store-based dietary advice

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What is already known about the subject

- Clinic-based nutrition advice from registered dieticians has a modest impact on health.
- Non-tailored point-of-purchase nutrition advice has produced mixed effects on consumer behaviour.
- Little is known about how tailored nutrition advice in the grocery store impacts behaviour.

What this study adds

- This study shows that tailored nutrition advice given to patients with obesity in the setting of the grocery store produces greater gains in knowledge and similar changes to reported behaviour as clinic-based advice and it is well-liked by patients.

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Summary

The objective of this study was to test the feasibility and preliminary efficacy of a store-based dietary education intervention against traditional clinic-based advice. Patients with obesity ($n = 55$, mean [standard deviation, SD] age 44.3[9.2] years, 64% women, 87% non-Hispanic Black) were randomized to receive dietary counselling either in a grocery store or a clinic. Change between groups (analysis of covariance) was assessed for outcomes including: dietary quality (Healthy Eating Index – 2005 [0–100 points]), and nutritional knowledge (0–65-point knowledge scale). Both groups reported improved diet quality at the end of the study. Grocery participants had greater increases in knowledge (mean [SD] change = 5.7 [6.1] points) than clinic participants (mean [SD] change = 3.2 [4.0] points) ($P = 0.04$). Participants enjoyed the store-based sessions. Grocery store-based visits offer a promising approach for dietary counselling.

Keywords: Grocery store, nutrition education, obesity, registered dietician.

Introduction

Unhealthy dietary choices contribute to the development and exacerbation of cardiometabolic disease, including obesity, type 2 diabetes and cardiovascular disease (1–3). Shifting dietary patterns (4), along with increasing rates of obesity (5) and obesity-related comorbidities (6), in recent decades have left medical and public health professionals with a population-wide health crisis. Despite attempts to address unhealthy diets through nutrition counselling, the presence of nutrition facts labelling, governmental campaigns to promote a more healthful diet, and a growing emphasis of the consequences of poor dietary choices, Americans of all ages still fall short of many dietary recommendations (3,7–10).

Evidence-based behavioural interventions to improve diet and treat obesity tend to require high-intensity, high-contact programmes that may be difficult to implement in many clinical settings (11). However, more pragmatic programmes that utilize less-frequent counselling sessions have demonstrated some, albeit modest, effects on diet and downstream chronic disease burden (12,13). Given the

pressing need for dietary improvement in the US population, more pragmatic and innovative programmes are needed.

Nutritional advice from registered dieticians has traditionally been delivered in the clinical context, completely removed from the point at which patients make food-purchasing decisions. Moving these sessions into grocery stores or supermarkets might prove a more effective method of promoting behaviour change, as the information would be delivered in the context of food shopping and could therefore be rendered more relevant and tangible to the patient.

There is ample existing evidence for point-of-purchase (POP) interventions that attempt to alter consumer behaviour by improving the healthfulness of purchases. These interventions range from changes to product labelling and packaging, to altering the physical landscape of the purchasing environment, to differential pricing of items (e.g. taxes and subsidies) (14–19). The effectiveness of such interventions is variable, and many of them (e.g. taxation, altered signage, healthier check-out aisles) are not easily tailored to individual health needs. There is considerably less evidence available on interventions where registered dieticians or health educators conduct sessions with individual consumers in the grocery store or supermarket (20). In part, this could be due to the perceived resource-intensity of such programmes.

In this pilot study, we compared dietician counselling in a supermarket to traditional clinic-based dietician counselling. The aims of the study were to determine the feasibility of the intervention and measure its efficacy in changing knowledge and reported dietary intake.

Methods

Design

This study was a non-blinded pilot randomized controlled trial of a moderate-intensity behavioural intervention for dietary advice.

Setting/Participants

Kaiser Permanente Georgia (KPGA) is a health maintenance organization (HMO) serving a group of approximately 250 000 members in the Atlanta metro area. For the purposes of this study, employees of one of KPGA's large employer accounts were recruited in the summer of 2013. Employees were considered eligible to participate if they were KPGA members who had visited their primary care provider or a specialist within the previous 6 months, had an overall clinic no-show rate of less than 10%, had a body mass index (BMI) in the 'obese' category (≥30 kg m^{-2}) by electronic medical record (EMR) measure within the last 12 months, were not actively participating in other weight-loss programmes, and were not pregnant or undergoing cancer treatment. A total of 2822 potentially eligible members were identified by EMR screening. In random blocks of 50, we sent letters to these members and then followed up with a phone call for recruitment and final determination of eligibility. During this call, the research assistant asked whether the individual was responsible for conducting at least 50% of the grocery shopping for their household. Those who answered 'no' were ineligible for the study. Those who met all criteria and expressed interest were scheduled for an in-person baseline visit at a medical office building, where informed consent was obtained (Fig. 1). Of 250 members who received letters, 55 were enrolled (22%). Complete follow-up data were obtained on 50 (91%). Two participants in the clinic arm and three in the grocery store arm were lost to follow-up after their first or second in-person visits.

The study protocol was reviewed and approved by KPGA's Institutional Review Board, and the study was registered with ClinicalTrials.gov (NCT01837524).

Intervention

After each participant consented and completed baseline surveys, a sealed envelope was opened to randomize them into one of two arms – a grocery store (intervention) or clinic-based visit (control) arm. Both groups received an initial 30-min phone call with the study's registered dietician, during which she reviewed their health history, medications, allergies, dietary habits and goals, as well as their food budget, shopping and meal patterns. Then, participants in both groups attended three, one-on-one, in-person visits with a dietician. One dietician conducted all study visits. Visits were 60 min long and took place monthly, covering a set curriculum, including discussion of the MyPlate model (21) and food groups, portion control, label reading and nutritional facts, food preparation and other topics. The educational content of the curriculum was selected based on the subject matter that is typically covered in weight management sessions with KPGA dieticians. Although the content was largely informational, the registered dietician also worked with participants on issues such as improving social support (e.g. among family members), and improving self-efficacy in making better choices and trying new foods. Furthermore, participants were educated about the negative health consequences of poor dietary choices, and taught about how different choices might improve their health outcomes. This discussion was individualized based on the participant's specific medical problems. The dietician also worked with participants on building skills such as label reading, giving them repeated opportunities to demonstrate the new skills they had gained. The once per month schedule of visits was

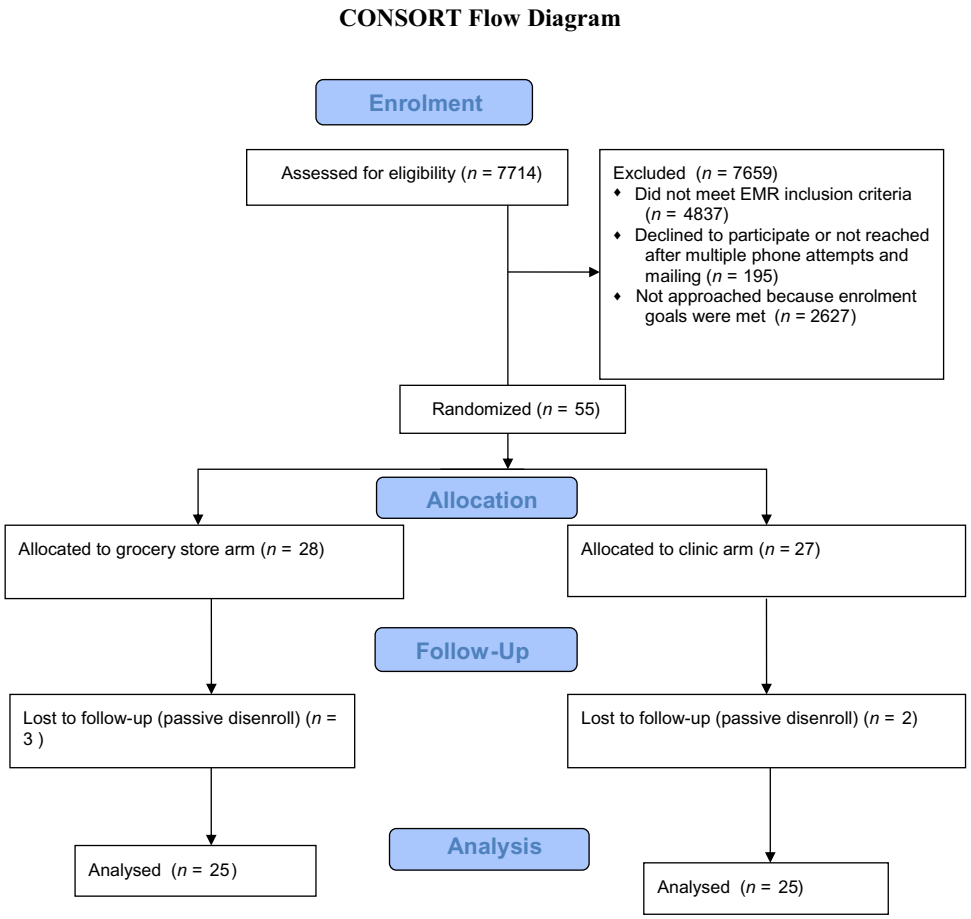

Figure 1 CONSORT flow diagram.

chosen to simulate real-world clinical visit frequency with registered dieticians.

The only difference between the two arms in the study was the location of the monthly in-person dietician sessions. Grocery store participants attended all of their dietician study visits while shopping in a grocery store; clinic participants had all of their visits in a clinic room at one of our local medical office buildings. For store-based visits, the dietician and participant used the store itself to facilitate learning. Visits were scheduled in an attempt to coincide with the day of the week/month on which a participant would normally do his/her grocery shopping. When the dietician and participant arrived at the store, rather than sitting in one place to discuss curriculum, they shopped together, walking through the store with a grocery cart. This allowed the participant to visualize in real-time items that the dietician was teaching them about (and potentially to buy new things they had not tried before), and to ask about other items that they might usually purchase. At the end of each store-based visit, participants purchased their groceries and were given 'homework assignments' including trying out new recipes. All grocery store visits were conducted at a single location (one grocery store near the medical office building), regardless of a participant's usual shopping locations. All clinic visits were conducted in one clinic location, regardless of a participant's primary clinic location. As an incentive to attend visits, study participants were provided with a $50 USD grocery store gift card at each of the three in-person study visits. We chose large financial incentives for participants because of concern that store-based dietician visits may lead participants in this arm to buy some more expensive foods. We did not want participants to experience a financial burden to participate. For equivalence across arms, we provided these same incentives for clinic arm participants. Insurance copayments, typically required for one-on-one dietary consultations, were waived in both groups.

After completing the three intervention visits with the dietician, all participants met for a final visit with the research assistant at a clinic building to provide post-intervention data. Each participant who completed follow-up had five in-person visits and one phone-based

visit. Recruitment, intervention and data collection were completed from May to October 2013.

Measures

The primary outcome measure for this study was change in dietary quality over 3 months, as measured by the 2005 Healthy Eating Index (HEI). The HEI is a 100-point scale developed by the US Department of Agriculture to provide an overall summary score of dietary quality (22). To collect the dietary information required for calculation of the HEI, the 3-month written version of the Block Food Frequency Questionnaire (FFQ) was administered both at baseline and follow-up for participants in both arms ($n = 50$). The Block FFQ is a validated tool for dietary assessment that provides an array of estimates of an individual's usual dietary intake – in this study, over a 3-month recall period (23,24). For this study, other measures estimated by the Block FFQ, namely daily caloric intake, as well as fruit and vegetable, saturated fat, sodium and added sugar intake were also assessed. Completed FFQ's were analysed by Nutrition Quest, the originators of the Block FFQ.

Several secondary outcomes were assessed. First, participants' knowledge on a range of common nutritional topics and guidelines was measured using a modified version of a previously validated instrument from the United Kingdom (25). The instrument was modified to reflect current dietary recommendations and locally appropriate food choices. Questions covered topics such as what foods or food groups are generally recommended by experts, recommended caloric intake for an average adult, and what foods are higher in sodium, added sugar, fiber, or fat. Total possible score on the knowledge assessment instrument was 65 points.

Although participants did not have frequent enough EMR measures to allow objective assessment of weight change, self-reported weight at baseline and follow-up was collected on all participants. Finally, because of concerns that co-shopping with a dietician could lead to increased food costs for participants, we queried participants regarding their self-reported food budget, including whether their costs changed during the study.

All outcomes were measured at baseline and at the 3-month follow-up assessment. Subjects were provided with an additional $25 incentive for coming to each of these assessment visits.

Demographic and health data including patient age and sex were captured from the EMR, and additional demographic data including race/ethnicity, marital status, educational level, income category, and whether or not a participant had children living in their home were self-reported.

Analytic methods

To determine whether there was a difference in the change across time between the grocery and clinic arms, the residualized change approach with analysis of covariance was used, where arm was the independent variable and the covariate was participants baseline values on each of the outcomes (knowledge score, HEI, weight, other self-reported nutritional values). The dependent variable was the change in score between follow-up and baseline. SAS v9.2 (SAS Institute Inc., Cary, NC) was used to conduct all data analysis.

Results

Participant characteristics

Participants in the grocery and clinic arms were similar with respect to baseline characteristics (Table 1). A majority of participants were female (64%) and African American (87%); the remainder self-identified as non-Hispanic White. The mean (standard deviation, SD) age of participants was 44.3 (9.2) years. The mean (SD) self-reported BMI of participants at baseline was 34.8 (5.0) kg m^{-2}, and 82% indicated that they were currently trying to lose weight. Just over half of participants (53%) were currently married or living with a partner, and a greater number

Table 1 Baseline covariates among randomized participants

Variable	Clinic arm ($n = 27$)	Grocery store arm $n = 28$)	*P*-value*
Sex (*n*/% female)	15 (56%)	20 (71%)	0.22
Race (*n*/% African American)	23 (85%)	25 (89%)	0.65
Age (years) (mean, SD)	43.4 (8.2)	45.1 (10.0)	0.49
BMI (kg/m^2) at baseline (mean, SD)	34.1 (5.3)	35.6 (4.7)	0.27
Marital status (*n*/% married or partner)	14 (52%)	15 (54%)	0.89
Children in home (*n*/% yes)	18 (67%)	19 (68%)	0.92
Educational level (*n*/% four-year college degree or higher)	12 (44%)	10 (36%)	0.51
2012 income category (*n*/% $50k USD or greater)	17 (65%)	14 (52%)	0.32

*Chi-squared test for categorical variables, *t*-test for continuous variables.
BMI, body mass index; SD, standard deviation.

(67%) were caring for children in their home at the time of the study. Forty percent had at least a 4-year college degree, and over half (60%) reported a 2012 household income of $50 k or greater.

Change in reported dietary intake over the 3-month study period

Both groups reported improvements in a number of measured categories for dietary quality (Table 2). At baseline, the mean (SD) baseline HEI – 2005 score for clinic participants was 61.9 (8.5) points for grocery participants was 61.3 (11.9) points. Between baseline and follow-up, the mean HEI – 2005 score improved in both arms. The changes in score did not differ between the two groups ($P = 0.80$). At baseline clinic participants reported a mean (SD) daily energy intake 6820 (3264) kJ, whereas grocery participants reported 8263 (4569) kJ. At follow-up both groups reported substantially decreasing their daily energy intake, with greater raw decreases among grocery participants. However, the between group differences were not statistically significant ($P = 0.42$). Both groups also had substantial decreases in dietary components such as sodium intake and calories from sugar-sweetened beverages (Table 2), but, as with the total energy intake measures, there were no significant between group differences for these measures.

Table 2 Residualized changes in selected dietary component values as reported by participants

Dietary component	Clinic arm ($n = 25$)*	Grocery arm ($n = 25$)*
Δ HEI – 2005 (points)	4.5	5.0
Δ Energy intake (kJ)	–2230	–1782
Δ Sugary beverages (kJ)	–285	–285
Δ Total fat (g)	–26	–20
Δ Saturated fat (g)	–8.4	–6.3
Δ Sodium (mg)	–775	–557
Δ Dietary fibre (g)	–1.4	–0.8
Δ Vegetable servings	0.05	0.4
Δ Fruit servings	0.3	0.1
Δ Meat servings	–0.8	–0.5
Δ Whole-grain servings	–0.1	–0.2

*Residualized change for each arm – no significant between group differences were detected for any of the reported dietary changes.
HEI, Healthy Eating Index.

Change in nutritional knowledge over the 3-month study period

Nutritional knowledge scores of all participants improved over 3-month intervention. Grocery store participants exhibited a significantly larger increase in knowledge scores (baseline mean [SD] score 44 [6.3] out of a maximum of 65 points; mean improvement 5.7 [6.1] points) after participating in the study than clinic arm participants (baseline score 45 [5.4] points; mean improvement 3.2 [4.0]) ($P = 0.04$).

Change in self-reported weight over the 3-month study period

Participants in both study arms reported losing some weight, on average, over the 3-month intervention, although the amount of weight change was highly variable. Mean (standard deviation.) weight loss in clinic participants was reported as 1.2 (3.2) kg (baseline 96 [15] kg), and in grocery participants was reported as 2.0 (3.1) kg (baseline 100 [13.6] kg). Residualized changes were not significantly different between the two groups ($P = 0.46$).

Cost of shopping

When surveyed at the final study visit, the vast majority of participants in both groups reported spending more on their grocery store purchases during the study, compared with the 3 months prior to participating. However, a substantial fraction of participants also reported spending less on other food sources, such as restaurants or take-out (Table 3). There was no significant difference in reported changes in spending patterns between the study groups.

Table 3 Reported spending on food/beverages during vs. prior to the study

Food category	Clinic arm ($n = 25$)	Grocery arm ($n = 25$)	*P*-value*
Grocery store	88% spent more 8% spent less 4% no change	96% spent more 4% spent less	0.43
Restaurants	64% spent less 36% no change	60% spent less 40% no change	0.77
Delivery food	36% spent less 64% no change	40% spent less 60% no change	0.77
Miscellaneous (gas station, vending machine, etc.)	36% spent less 64% no change	24% spent less 76% no change	0.36

*Analysis of variance.

Discussion

In this pilot randomized trial of a grocery store-based dietary education intervention for health plan members with obesity, participants in the grocery store arm exhibited significantly more improvement in nutritional knowledge compared with those who received their intervention in the traditional clinic setting. Participants in the grocery store arm also had greater improvements in some measures of diet quality and reported more weight loss than participants in the clinic arm, although these differences were not statistically significant.

Although this programme is not a traditional POP intervention such as menu labelling or changing prices to encourage healthier purchases, it does bring the delivery of nutritional information into a more relevant context for patients. Traditional POP interventions capitalize on this same idea – if you want to change the way someone eats, target them at the point where they are deciding what to buy, not when they are sitting at their doctor's office (14). Even with very hands-off POP interventions, such as in-store marketing or menu labelling, some studies have observed an impact on consumer behaviour (17,26). On balance, however, much more research is needed on the most effective methods of changing food-purchasing behaviour, including further evaluation of more tailored approaches such as this one (19,20,26). Compared with an ecological approach, our tailored approach of multiple sessions with a dietician requires more time commitment from the dietician and patient. Although we did not conduct a cost-effectiveness evaluation, it is important to consider any additional resources that would be needed to scale such a programme beyond the scope of this work. In the context of our HMO, registered dieticians are already regularly working with patients in 1:1 office-based sessions, so an in-store counselling programme would merely represent a shift in the location of those sessions. However, in settings where dietician sessions are not readily available, the start-up costs for store-based dietician counselling might be considerable. Another cost to consider might be the risk of additional spending on groceries that could be incurred by individuals if shopping with a registered dietician. Because we were concerned about that as well, we attempted to collect grocery receipt data at baseline and during the intervention from all participants. We were unable to obtain receipts from the majority of participants; however, we did modify an exit questionnaire to ask them to report subjectively on changes to their food budgets while participating in the study. Furthermore, the study dietician was trained to be mindful of expenses while shopping with participants. From baseline to the 3-month follow-up period, participants did report increasing their grocery costs; however, they seemed to compensate for increased grocery costs by decreasing their spending on food in other settings, such as restaurants.

To best simulate the real clinical experiences of patients in our HMO, this pilot trial was, by design, much less intense than many existing behavioural interventions for nutrition. We attribute the excellent participant retention throughout the study in part to this lower-intensity intervention, although it was also likely partially because of the financial incentives provided for participation. Regardless, the pilot did serve to establish the feasibility and preliminary efficacy of grocery store-based dietician visits for obese patients. In focus groups held at the end of the study, grocery store participants rated the intervention quite highly and in particular were appreciative of their ability to tailor the store-based sessions to their usual shopping habits. Some, who had worked with a dietician previously in a clinic setting, said that they found the store-based sessions far more effective for this reason. They were also appreciative of the once-a-month frequency of visits and noted that more frequent visits would have been difficult because of competing time commitments. As raised earlier, however, the notion of tailoring nutritional interventions to individuals requires a trade-off of impacting fewer people, and it is unclear from the limited studies that have been conducted in this arena whether or not these interventions are worth the extra work (3,20,27).

One important stakeholder in this process that deserves mention is that of the grocery store itself. In our experience with this pilot, we chose to communicate with the store manager prior to the intervention to obtain his permission and make him aware of our planned intervention. We encountered no barriers from the store either in preparation for the intervention, or during the study period itself. Whether this attitude would translate to a larger-scale programme, and to what degree grocery stores could be engaged in the process are important questions for future research.

One unique feature of this pilot study is that the vast majority of participants (85%) self-identified as African American, a group that is disproportionately burdened by obesity (5). Furthermore, African Americans, especially Black women, have traditionally experienced sub-par weight-loss outcomes in dietary and weight management studies compared with their non-Hispanic White counterparts (28). It is promising that a group traditionally underrepresented in research and overburdened by weight-related disease responded favourably to this intervention.

This pilot study had several important limitations. Because it was designed primarily to establish feasibility and determine acceptability of the intervention for patients and dieticians, this pilot enrolled a small pool of participants. The small sample may have limited our ability to detect significant differences between the groups, especially for the dietary outcomes. There was significant variability

in the dietary intake that was reported, with a few participants reporting implausibly low caloric intake (e.g. less than 2000 kJ per day), a problem commonly encountered with the use of single FFQ instruments to assess dietary intake (29). Furthermore, certain aspects of dietary recall instruments, such as reported energy intake, may be less accurate in racial/ethnic minority populations such as African Americans (29,30). The high degree of variability in reported intake by the participants, combined with the small sample size in this pilot, may have limited our ability to detect statistically significant differences in dietary effects between the two groups. Despite the difficulties with the FFQ data, participants at baseline reported consuming a large amount of sugar-sweetened beverages, sodium, and red meat, all of which decreased substantially after intervention.

The participants in our study overall reported a diet at baseline that scored slightly higher than the reported national average for HEI – 2005 (31). This could indicate that our participants were not representative of the underlying population but rather a highly motivated subset who were willing to participate in an intervention to improve their diet. The large financial incentives associated with our dietician visits could be perceived as a limitation. It is possible that the size of the incentives facilitated the purchase of healthier foods, thereby making it difficult to determine the independent effect of the sessions themselves. However, both groups received these incentives, so there is no reason to expect that they would have differentially impacted behaviour. Another limitation of the pilot was the lack of long-term follow-up, making us unable to comment on the durability of the intervention. Most importantly, the pilot was not designed to look at health outcomes such as weight loss or changes in haemoglobin A1c, nor was it designed to be able to assess the cost-effectiveness of our intervention. Our outcome of self-reported weight loss clearly needs to be replicated using objective measures. A larger and longer-term follow-up study will be required to examine health outcomes, as well as other practical issues such as cost-effectiveness.

Conclusions

In this novel pilot study, store-based dietary counselling for patients with obesity was more efficacious than clinic-based counselling for improving nutritional knowledge, and at least as efficacious for improving diet quality. Further study with a larger population and longer follow-up, including health outcome data and cost-effectiveness evaluations, will help to better inform this promising approach to delivering dietary advice. For health systems that currently offer registered dietician services; however, patients may respond more favourably to meeting with their dietician in the store than in the clinic.

Conflict of Interest Statement

The authors have no conflicts of interest to disclose. This work was funded by a grant from the Sackler Institute for Nutrition Science, a branch of the New York Academy of Sciences.

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KL and JB conceived the study, KL/JB/DR designed the intervention and evaluation, KL and ML conducted data analysis. All authors contributed to manuscript preparation. We would like to acknowledge Melanie Baker, Kathy Pines and Mia Gallagher who worked on the study, as well as Jane Wardle for her input (phone) regarding the knowledge assessment.

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