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Original Study

Protein-Enriched Bread and Readymade Meals Increase Community-Dwelling Older Adults' Protein Intake in a Double-Blind Randomized Controlled Trial

Canan Ziylan MSc^{a,b,*}, Annemien Haveman-Nies PhD^b, Stefanie Kremer PhD^a, Lisette C.P.G.M. de Groot PhD^b

^a Consumer Science and Health, Wageningen Food & Biobased Research, Wageningen, The Netherlands

^b Division of Human Nutrition, Wageningen University, Wageningen, The Netherlands

A B S T R A C T

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meals-on-wheels
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Objectives: Sufficient protein intake can decrease undernutrition risk among community-dwelling older adults. This study aimed to increase community-dwelling older adults' daily protein intake with acceptable and applicable protein-enriched bread and readymade meals at home.

Design: Double-blind randomized controlled trial of 2 weeks.

Setting: Senior residential center in the Netherlands.

Participants: Forty-two community-dwelling elderly residents (≥ 65 years) participated, with a mean age of 74.0 ± 6.9 years and mean body mass index of 28.5 ± 3.45 kg/m².

Intervention: The intervention group ($n = 22$) received 5 protein-enriched readymade meals and plentiful protein-enriched bread during 2 weeks, whereas the control group ($n = 20$) received the regular equivalents during these 2 weeks.

Measurements: Food intake was assessed by using dietary food record-assisted 24-hour recalls and by weighing meal leftovers. Acceptability of the enriched products was assessed with product evaluation questionnaires and in-depth interviews.

Results: Mean intake of food products (g) and energy (kJ) did not differ significantly between the control and the intervention groups. Total daily protein intake in the intervention group was 14.6 g higher than in the control group (87.7 vs 73.1 g/d, $P = .004$). Expressed in g/kg body weight per day, protein intake was significantly higher in the intervention group than in the control group (1.25 vs 0.99 g/kg/d, $P = .003$). The enriched products were equally liked, scoring 7.7 of 10.0. The in-depth interviews with participants indicated high acceptability of the enriched products.

Conclusion: This study showed that community-dwelling older adults' protein intake can be increased to recommended levels with highly acceptable and applicable protein-enriched products that fit into the normal eating pattern. Future studies should investigate whether this effect is maintained in the long-term among a frailer population.

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The authors declare no conflicts of interest.

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* Address correspondence to Canan Ziylan, MSc, Consumer Science and Health, Wageningen Food & Biobased Research, P.O. Box 17, 6700 AA Wageningen, The Netherlands.

E-mail address: canan.ziylan@wur.nl (C. Ziylan).

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Worldwide, 1 in 20 community-dwelling older adults suffers from undernutrition,¹ as does 1 in 10 Dutch community-dwelling older adults.² Given that almost 1 in 5 Dutch inhabitants is 65 years or older and that this proportion is expected to become 1 in 4 by 2040, undernutrition will affect a growing share of the population.³ The negative consequences of undernutrition call for action on its numerous causes.⁴ In developed countries, undernutrition in many older adults is caused by protein-energy wasting.^{5,6} As the PROT-AGE group has described extensively, this wasting is caused mainly by inadequate food intake, reduced capacity to use available proteins, and

a higher need for protein due to a lifelong cumulative physical decline.⁷ This higher need for protein is at odds with the lower food intake demonstrated by many older adults. Although the general recommendation for all adults is set at 0.8 g protein per kilogram body weight per day (g/kg/d), experts recommend a daily protein intake of 1.2 g/kg/d for community-dwelling older adults.⁷

In Dutch community-dwelling older adults, protein intake is approximately 1.0 g/kg/d,⁸ implying room for improvement. In this context, researchers have been investigating strategies to increase older adults' protein intake without having to increase their food intake.⁹ For community-dwelling older adults, common strategies include dietary advice, high-protein foods, small meals, between-meal snacks, regular product enrichment, and oral nutritional supplements (ONSs).^{9,10} Despite the obvious positive effects of ONSs on protein intake in individuals in clinical settings,^{11,12} in less supervised contexts such as at home, ONSs have limitations due to their taste challenges and older adults' low willingness to consume them repeatedly.^{13,14} In addition, older adults are in general poorly aware of their often deteriorating health status, despite their high risk of undernutrition.¹⁵ This discrepancy between actual and perceived health status leads to a low likelihood to largely deviate from existing dietary patterns. This notion calls for an investigation of the strategy to increase protein intake with regular products that fit into older adults' dietary behavior and thereby do not require such large deviations.

A systematic review showed potential for protein-enriched products among older adults,⁹ but most of the studies had been conducted within a clinical setting rather than at home. For example, protein-enriched bread was shown to be effective in increasing protein intake in the Dutch clinical setting.^{16,17} Likewise, we investigated protein-enriched readymade meals within a laboratory setting and found that these meals resulted in significantly higher protein intakes in 120 vital community-dwelling older adults.¹⁸ However, some of these meals resulted in higher ratings of satiety 2 hours after consumption, and this could negatively affect food intake for the rest of the day. Moreover, the laboratory setting might have elicited different behavior than the home setting would.¹⁹ In addition, the question remained whether such meals are still acceptable when continuously consumed instead of only once per week. For these reasons, we currently aim to investigate the effectiveness of protein-enriched readymade meals and bread in increasing daily protein intake over 2 weeks. Here, we aim to investigate whether such products fit in existing dietary behavior in a regular daily life setting. In a double-blind randomized controlled trial (RCT), we tested whether older adults reach the 1.2 g/kg/d daily protein recommendation in their regular eating environment at home. It was hypothesized that the participants in the control and the intervention groups would consume equal amounts of the meals and bread, leading to a significantly higher daily protein intake in the intervention group than in the

control group. Moreover, we hypothesized that this higher intake would be attributable to the large acceptability and applicability of the protein-enriched products in existing dietary behavior.

Methods

Design

This study was conducted as a 2-week double-blind RCT in a senior residential center in November 2015, with the week before the RCT serving as a baseline week (Figure 1). The randomized participants received either protein-enriched bread and meals (intervention group) or regular bread and meals (control group) for 2 consecutive weeks. The study was approved by the Medical Research Ethics Committee and the Social Sciences Ethics Committee of Wageningen UR, and written consent was obtained from all participants.

Participants

The participants were recruited among elderly residents at a senior residential center in the eastern Netherlands. This center is inhabited by community-dwelling older adults only and provides the residents with specific activities and facilities for older adults. These self-sufficient residents do not require continuous care and monitoring like residents of long-term care facilities and vary in their level of self-arranged use of domestic help, home care, and meal services. Residents were eligible when we established after screening that they (1) were aged 65 years or older; (2) were able to choose and eat their food by themselves; (3) liked whole-wheat bread and at least 5 of the 8 offered meals; (4) did not have an allergy/intolerance for milk, lactose, soy, or gluten; (5) were not following a diet that disallowed the use of normal bread or meals; (6) were not suffering from renal insufficiency (estimated glomerular filtration rate < 60 mL/min) or other medical conditions that limit intake of protein-enriched foods; (7) were not suffering from a terminal illness; (8) had a Mini Mental State Examination score ≥ 24 ; and (9) gave permission to contact their general practitioner (GP) to confirm eligibility regarding allergies/intolerances and renal insufficiency/medical conditions. All 308 elderly residents were invited to participate in the study with a leaflet briefly informing them about the study background to prevent any influence of new nutritional knowledge on future measurements. In total, 42 participants were enrolled and randomly allocated to the 2 treatment groups by a researcher who was not involved in the overall study (Figure 2). Couples were assigned to the same treatment group to prevent them mixing up the received products or noticing any differences between the products of the control and the intervention groups.

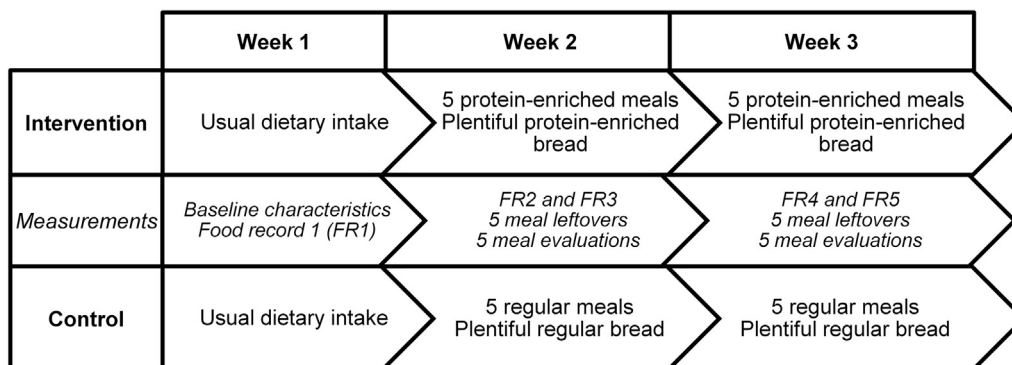


Fig. 1. Schematic overview of the study design and measurements.

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