Reply to TR Fenton and CJ Fenton

Dear Editor:

I agree with Fenton and Fenton that the current evidence on the paleo diet might be considered early or preliminary and that further research is critically needed. There is a risk of great societal harm if dietary guidelines and recommendations are issued without a strong foundation of evidence from methodologically robust randomized controlled trials (RCTs), ideally trials comparing different dietary patterns.

The systematic review includes only 4 trials with a total of 159 patients (1). This is its major limitation. As Fenton and Fenton point out, this leads to wide CIs, with a lower limit of only 0.04 cm for the waist circumference outcome. This is a clinically unimportant difference. Would anyone even notice such a small loss of fat at their waist? Furthermore, would this outcome correlate with benefits on outcomes important to patients, such as heart disease and stroke? DynaMed Plus downgraded the level of evidence for this systematic review because of surrogate outcomes and also because of the wide CIs that included clinically unimportant differences (2, 3). Whether to focus specifically on which CIs cross the line of no effect (P ≥ 0.05) is debatable. Bland and Altman (4) argued recently in the Journal that CIs are “so much more informative [than P values].” If the difference is not significant, the CI gives us a range of possible differences in the population that would be consistent with the data observed”. In a seminal 1986 article comparing CIs with P values, Gardner and Altman (5) concluded with, “Confidence intervals, if appropriate to the type of study, should be used for major findings in both the main text of a paper and its abstract.”

Currently available trials of the paleo diet measure mostly surrogate outcomes, at the short term. To generate reliable data on clinically important outcomes, long-term trials are needed. Such trials are expensive but worthwhile, given that the health effects of the “paleo” diet, arguably the world’s most popular diet, is a question of great interest to the public. As Chalmers et al. (6) and others (7) have noted, public funders are worthy of comment.

Phase angle, vector length, and body composition

Dear Editor:

The highly relevant and informative article by Gonzalez et al. (1) explores the relation between phase angle (PA; arctangent reactance/resistance 180°/r) and body composition, thus providing a platform to better understand the biological meaning of a variable that has great potential in research and in medical practice. The comparison with a reference technique in a large sample of healthy subjects provides the basis for robust conclusions about the major determinants of PA variation—that is, age, extracellular water-to—intracellular water ratio, fat-free mass, height, and population. However, some features of the research are worthy of comment.

The study shows that age is the most important determinant of PA variation and that a greater age is associated with a lower PA. Such a trend of decreasing PA with age is typical in older people. In fact, government dietary recommendations that are introduced in the absence of supportive evidence from RCTs have the potential to do great harm (10). Investing in and acting on evidence from RCTs comparing dietary patterns is an imperative for the protection of public health.

I thank Loren Cordain and Brian S Alper for providing useful comments. The author had no conflicts of interest.

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PAs show an increasing trend in children (2), a stable trend in young adults, a decline from the age of 40 y (3, 4), and a pronounced decrease after the age of 65 y, especially in men (5). The sample analyzed by Gonzalez et al. (1) is part of a previously studied sample, with ages ranging between 18 and 94 y (1442 of 1967 individuals) (3). Unfortunately, the authors only show the IQR of age in the 1442 individuals (IQR: 31–61 y) and do not discuss the diverse relation in adults and older people. Nevertheless, the observed association between PA and fluid distribution is very useful in the interpretation of body-composition variations in older people, in whom dehydration and variations in extracellular or intracellular water are common and contribute to major causes of morbidity and mortality.

A recent Cochrane review on symptoms, signs, and tests for identification of water-loss dehydration showed that only a few methods are suitable for assessing hydration status in older people (6). One of the 3 tests selected for having some ability to diagnose dehydration is based on the same bioimpedance at 50 kHz, particularly on resistance. Indeed, the relation between resistance and total body water is a fundamental principle of bioimpedance and is inherent to Ohm’s law.

An interesting synthesis of the insights from research on PA and resistance is represented by the bioelectrical impedance vector analysis (BIVA) approach (7). The BIVA jointly analyzes resistance and reactance, and the derived variables PA and vector length (i.e., impedance, mainly due to resistance), thus giving more accurate information on body composition.

The results discussed by Gonzalez et al. (1) are consistent with BIVA expectations, both with the classic BIVA (7), mainly related to hydration status, and the recently proposed specific BIVA (8, 9), validated for assessing 2-compartment body composition. These last methodologic studies were performed in a US sample of multiethnic adults (8) and in a more homogeneous sample of elderly Italian individuals (9). Classic and specific BIVA approaches showed the same negative relation between extracellular water–to–intracellular water ratio and PA (8) observed by Gonzalez et al. (1). Furthermore, in agreement with the authors’ suggestion about the importance of fat-free mass index (1), PA was found to be positively related to skeletal muscle mass index (8) and to fat-free mass index in both sexes (9). Otherwise, the relation between PA and BMI showed less consistent results. In fact, the majority of studies indicated a positive relation (4) limited to normal- or overweight individuals (3, 8, 10). Gonzalez et al. (1) observed a positive association in the correlation analysis (the authors’ Table 2) and a negative one when controlling for covariates (multivariate linear regression analysis; the authors’ Table 3 and Discussion). This implies different information is given by BMI in the 2 analyses. In the regression analysis, the effect of BMI on PA could be due to the residual information not explained by the covariates included in the model (particularly height and fat-free mass). It could possibly be related to the relative quantity of fat mass. Such a hypothesis is coherent with the negative correlation observed between PA and BMI in severely obese individuals (4), and with the decreasing PAs observed for higher values of fat mass percentage (FM%) by Buffa et al. (8).

Furthermore, the vector approach allows a better comprehension of body composition than does the consideration of only PA independent of vector length, or the resistance component independent of reactance. In fact, in classic BIVA, the vector length allows distinguishing different hydration conditions for a given PA (7), whereas in specific BIVA it allows the distinction of different quantities of FM%. For example, in a sample of the US adult population (8) and in a sample of elderly Italians (Figure 1) (9), groups of individuals characterized by quite identical PA, but increasing specific vector lengths, showed increasing values of FM%.

![Figure 1](image-url)  
**FIGURE 1** Increasing values of vector length and FM%, corresponding to similar PAs, in 4 groups of elderly women selected from the data set analyzed by Marini et al. (9). FM%, percentage of fat mass; PA, phase angle; Rsp, specific resistance; Xcsp, specific reactance.
In conclusion, in addition to the relevant information associated with PA, the vector length should be also considered in the analysis of body composition. A more in-depth model, such as the one adopted in the vector approach, could enhance the variability [nearly 50% by using only PA (1)] explained by the relation between bioimpedance and body composition.

None of the authors had any conflicts of interest to declare or financial interests related to this letter.

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Reply to E Mereu et al.

Dear Editor:

We thank Mereu et al. for their interest in our article (1) and their valuable comments. Although not clearly stated, we did not show the complete age distribution of our sample because it was already reported in our previously published study in which phase angle (PA) reference values were described by age and sex (2). In this subsample of 1442 individuals, 72% of women and 74% of men were younger than 60 y. The distribution among decades is not different from the one shown in Table 2 of the original study with the use of the whole sample of 1967 individuals.

We agree that the classic bioelectrical impedance vector analysis (BIVA) method (3) and your recently proposed specific BIVA approach (4) are useful for assessing hydration status and body composition with measured resistance and reactance alone without an equation. Moreover, it is interesting that the authors came to the same conclusions that we did about the extracellular water to intracellular water ratio and fat-free mass index relations with these approaches. However, we emphasize that our intention in this article was not to use PA to predict body composition. Unlike the vector approach, our study aimed to determine how body-composition variables influence PA. We agree that, to this intention, the vector approach gives much more information than PA alone. Our intention was to understand how body composition and other variables influence PA variability with an aim of giving insights into PA prognostic function. We did not suggest that PA should be used to assess body composition.

In conclusion, we would like to reaffirm that the objective of our report was not to establish how PA could be used in the analysis of body composition; rather, we examined the relations between body composition and PA. We concluded that the variability in PA cannot be fully explained by between-individual differences in body composition, but that other determinants (extracellular water to intracellular water ratio and fat-free mass index) can partially justify its role as a useful biomarker that potentially has clinical value.

The authors had no conflicts of interests to declare.

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